US Army Corps of Engineers
New England District

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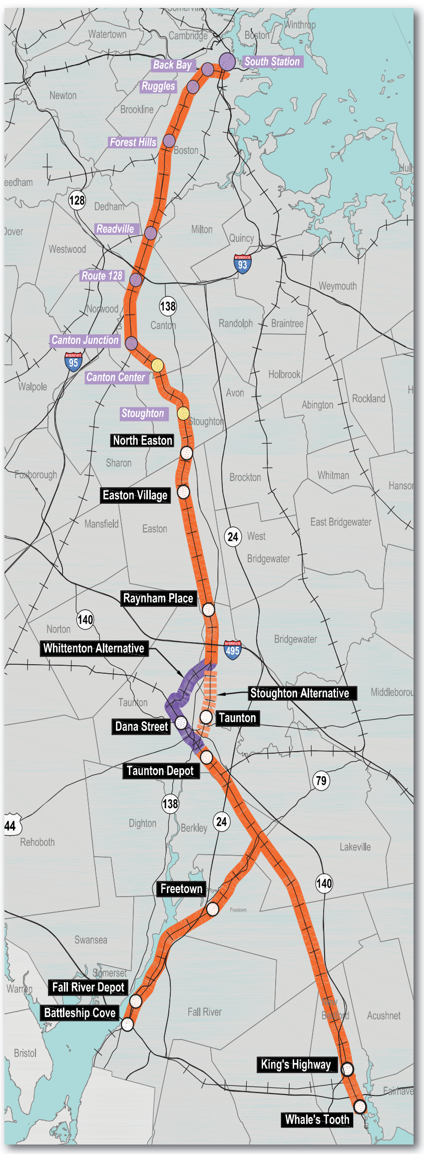
Final Environmental Impact Statement/ Final Environmental Impact Report

on the ***South Coast Rail Project***

proposed by the **Massachusetts Department of Transportation**



Department of the Army Permit Application Number NAE–2007–00698

Executive Office of Energy and Environmental Affairs EEA No. 14346

U.S. Army Corps of Engineers
New England District

August 2013

Volume I: FEIS/FEIR Text

Final Environmental Impact Statement / Final Environmental Impact Report

South Coast Rail Project

Bristol, Plymouth, Norfolk and Suffolk Counties
Commonwealth of Massachusetts

Department of the Army Permit Application Number NAE–2007–00698
Executive Office of Energy and Environmental Affairs EEA No. 14346

Lead Federal Agency:	U.S. Army Corps of Engineers, New England District, Regulatory Division 696 Virginia Road, Concord, MA 01742-2751
Cooperating Agencies:	U.S. Environmental Protection Agency Federal Transit Administration Federal Highway Administration Federal Railroad Administration

Abstract: This Final Environmental Impact Statement (FEIS) was prepared pursuant to section 102(2) (c) of the National Environmental Policy Act (NEPA) of 1969, as implemented by the Council on Environmental Quality regulations (40 CFR parts 1500-1508), and U.S. Army Corps of Engineers Regulations (Appendix B to 33 CFR part 325). This FEIS was prepared to assist in review of a Department of the Army Permit application submitted on May 8, 2008 by the Massachusetts Executive Office of Transportation and Public Works (currently known as the Massachusetts Department of Transportation, or MassDOT) under Section 404 of the Clean Water Act and potentially Section 10 of the Rivers and Harbors Act of 1899. The permit application was submitted for the discharge of fill material into waters of the United States (U.S.), ranging in area from less than eleven acres to approximately twenty-one acres (depending on the alternative selected), including wetlands, incidental to the construction of new public passenger rail (or other public transportation) facilities connecting the terminal stations of Fall River and New Bedford with South Station in Boston, Massachusetts (the Project). A "Notice of Intent" to prepare an Environmental Impact Statement on this permit application was published in the Federal Register on October 31, 2008.[1] Notices of Availability of the Draft Environmental Impact Statement (DEIS) were published in the Federal Register on March 25, 2011,[2] and April 1, 2011.[3]

The Massachusetts Department of Transportation (MassDOT) considered several transportation facilities and corridor alternatives to implement the proposed transit service over a distance of approximately 50 to 60 miles. Transportation modes considered included rail (diesel or electric) and rapid bus. Corridors considered included a rail corridor through Attleboro, Stoughton or Middleborough or a rapid bus service along the Route 24 corridor. MassDOT's preferred alternative is the Stoughton commuter rail alternative (using electric or diesel powered locomotives) which involves using the active freight rail lines from New Bedford and Fall River to Taunton, then using the inactive rail bed north to Stoughton, then using the active commuter rail tracks to South Station in Boston.

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[1] Federal Register 73:212, 64927-64928 (October 31, 2008)
[2] Federal Register 76:58, 16737 -16739 (March 25, 2011)
[3] Federal Register 76:63, 18218 (April 1, 2011; EIS No. 20110095)

The U.S. Army Corps of Engineers has determined that there is no practicable alternative to the Stoughton Electric alternative which would have less adverse impact on the aquatic ecosystem, and also does not have other significant adverse environmental consequences.

This document was prepared with the intent to serve as a Massachusetts Environmental Policy Act (MEPA) and NEPA document to comply with the procedural requirements of both state and federal law and serve as a combined Final Environmental Impact Statement (FEIS)/Final Environmental Impact Report (FEIR). The State's environmental review pursuant to the Massachusetts Environmental Policy Act (MEPA) (G. L. c. 30, ss. 61-621) and the MEPA regulations (301 CMR 11.00) is being conducted simultaneously with the NEPA process.

This FEIS/FEIR compares the direct, indirect and cumulative impacts of the alternatives on the natural, cultural and socioeconomic environment, including vernal pools and other wetlands; cultural resources; threatened and endangered species; transportation; air quality, including greenhouse gas emissions; noise and vibration; surface water and groundwater; hydrology and water quality; and socioeconomic effects. Mitigation is proposed to offset or reduce the unavoidable impacts of the alternatives. The FEIS/FEIR also provides responses to the public and agency comments received on the DEIS/DEIR, updated technical analyses conducted subsequent to the DEIS/DEIR, and the compliance of the alternatives with various state and federal environmental regulations.

A public notice announcing the availability of this document will be published concurrently with an announcement in the Federal Register. Copies of this FEIS/FEIR are available at repositories that are listed on the public notice. Under NEPA regulations, the U.S. Army Corps of Engineers must wait a minimum of 30 days following release of this FEIS/FEIR before it can complete its Record of Decision (ROD) on the applicant's proposed action. The ROD on whether to issue or deny a Department of the Army permit will likely take several months to complete after the FEIS.

C Samaris
Charles P. Samaris
Colonel, Corps of Engineers
District Engineer

29 Aug 13
Date

This report should be cited as follows:

U.S. Army Corps of Engineers New England District. 2013. *Final Environmental Impact Statement / Final Environmental Impact Report: South Coast Rail Project, Bristol, Plymouth, Norfolk and Suffolk Counties, Commonwealth of Massachusetts*. U.S. Army Corps of Engineers New England District, Concord, MA

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P0 PREFACE TO THE FEIR

This preface has been prepared by the Massachusetts Department of Transportation (MassDOT), which is solely responsible for its content. The preface documents MassDOT's compliance with the Massachusetts Environmental Policy Act (MEPA), provides a summary of the environmental review process for the South Coast Rail project, summarizes MassDOT's civic and agency involvement process, and identifies MassDOT's Preferred Alternative. Section P7 of this Preface summarizes the requirements of the Certificate issued by the Secretary of the Executive Office of Energy and Environmental Affairs (EEA) on the Draft Environmental Impact Report (DEIR) and how the Final Environmental Impact Statement/Environmental Impact Report (FEIS/FEIR) addresses each specific requirement.

P1 BACKGROUND

The South Coast Rail project is an initiative of MassDOT and the Massachusetts Bay Transportation Authority (MBTA) to bring public transportation to the South Coast region that will increase access to transit for an underserved area of the state, increase transit ridership, improve regional air quality, reduce greenhouse gas emissions, and support opportunities for smart growth and economic development.

This project is a priority transportation initiative for the Commonwealth of Massachusetts by the Patrick Administration, as documented in the April 2007 South Coast Rail: A Plan for Action and January 2013 The Way Forward: a 21st Century Transportation Plan.

Prior to 1958, the Middleborough, Stoughton, and Attleboro rail lines were part of the Old Colony Railroad System that provided service to Fall River and New Bedford from Boston's South Station, via Canton Junction, along the Stoughton Branch railroad. Since discontinuation of this service, commuter rail has only been available to southeastern Massachusetts along the Boston-Providence Shore Line, with stops in Attleboro and South Attleboro, and the Old Colony Middleborough Line, which terminates in Lakeville. However, none of these provide an opportunity for commuters from the Fall River or New Bedford areas to easily or efficiently access rail transportation to Boston.

The South Coast Rail project, to restore passenger rail service to the South Coast region, has been extensively studied in different configurations for almost 20 years. In 2002, a FEIR, prepared by the MBTA, concluded that the Stoughton Alternative was the most practicable and feasible of the alternatives and identified it as the preferred route. On August 30, 2002, the MEPA Secretary of Environmental Affairs issued a Final Certificate (Executive Office of Environmental Affairs [EOEA] File # 10509) stating that the FEIR adequately and properly complied with MEPA and its implementing regulations. The Certificate authorized MassDOT to proceed with planning for the South Coast Rail project as an extension of the existing Stoughton Line. However, further planning was delayed until 2007.

Section 404 of the Clean Water Act requires a Department of the Army permit for the discharge of dredged or fill material in waters of the United States. Accordingly, for the project to proceed to construction it is necessary for MassDOT to obtain a Section 404 permit from the U.S. Army Corps of Engineers (the Corps) and for the Corps to conduct a federal environmental review in accordance with the National Environmental Policy Act (NEPA).

The Commonwealth recognizes that the final determination of a recommended alternative must occur through a combined state and federal environmental review. Therefore, beginning in 2007 the Patrick-Murray Administration took a fresh look at the alternatives through a transparent and comprehensive evaluation.

The Corps and MEPA have agreed to coordinate the environmental review for the project. The Corps, the lead federal agency for the environmental review pursuant to NEPA, has prepared this federal Environmental Impact Statement (EIS), which MassDOT has reviewed and adopted as its state-required Environmental Impact Report (EIR).

The coordinated environmental review process began with a joint federal/state scoping process. MassDOT, as the lead state agency, submitted an Environmental Notification Form (ENF) to the Executive Office of EEA on November 15, 2008 for public review under MEPA, concurrent with the Corps' public scoping process under NEPA. The Secretary of the Executive Office of EEA issued a Certificate on the ENF, and a Scope for the Draft EIR, on April 3, 2009. A Draft EIR was filed with the MEPA Office on March 15, 2011 and the Secretary issued a Certificate on the DEIR, and a Scope for the Final EIR, on June 29, 2011. This Final EIR meets the requirements established in the Certificate, as described in detail in this Preface and the Response to Comments section of the FEIS/FEIR (Volume III).

P2 PROJECT GOALS

The purpose of the South Coast Rail project is to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts, to enhance regional mobility, while supporting smart growth planning and development strategies in affected communities.

The Corps, for purposes of Section 404 review, has adopted a modification of this statement as its "overall project purpose": The purpose of the South Coast Rail project is to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts to enhance regional mobility. MassDOT believes that the two purpose statements are consistent, and recognizes that the Corps will not consider the relative ability of the DEIS/DEIR alternatives to support smart growth planning in its determination of the Least Environmentally Damaging Practicable Alternative (LEDPA).

P3 CIVIC AND AGENCY INVOLVEMENT

To ensure effective and inclusive outreach to stakeholders throughout the various stages of project development, MassDOT has implemented a comprehensive community involvement process for the South Coast Rail project that included an Interagency Coordinating Group, the Southeastern Massachusetts Commuter Rail Task Force (Commuter Rail Task Force), and an extensive civic engagement process. This section reports on civic engagement since the publication of the DEIS/DEIR.

P3.1 COMMUTER RAIL TASK FORCE

The MEPA process that concluded in 2002 recognized the induced growth that could result from the project and called for a growth management task force to be created. In 2004, the Commuter Rail Task Force was formed to help the region prepare for the impacts of the re-introduction of passenger rail to the South Coast. Its membership includes representatives from the MBTA, regional transit authorities, cities and towns, environmental groups, and business and economic development organizations.

Currently, the group is staffed by the Southeastern Regional Planning and Economic Development District (SRPEDD) and chaired by Interim Chair Susan Peterson Teal.

The Commuter Rail Task Force provides a forum for state officials and local representatives to review and discuss all aspects of the project and to work toward consensus on strategies and actions to plan ahead for new growth in the region. The Task Force provides advice and assistance to MassDOT and the MBTA in the design of the project and in the implementation of the South Coast Rail Economic Development and Land Use Corridor Plan.

P3.2 CIVIC ENGAGEMENT SINCE THE DEIS/DEIR

MassDOT and the MBTA have continued the robust civic engagement process to help better design the project and address the concerns of the region's residents. Outreach includes community meetings with corridor municipalities, briefings for area legislators, large civic engagement meetings for members of the public, and small focused meetings on particular aspects of the project that are of interest to individuals and community groups throughout the corridor.

During preparation of the FEIS/FEIR, MassDOT has focused on civic engagement associated with the proposed commuter rail stations and layover facilities. This outreach has included an Open House in New Bedford, an Open House in Fall River as well as presentations to the city councils and community groups.

MassDOT maintains a project website (http://www.mass.gov/southcoastrail) to provide updated project information such as news releases, fact sheets, materials from the civic engagement meetings, Interagency Coordinating Group meeting materials and minutes, and past environmental reports. The website is updated regularly.

Aside from the project website, interested parties, elected officials, and residents are notified of upcoming meetings and new information through fact sheets, newspaper announcements, flyers and posters, cable-televised meetings, and/or e-mail notifications.

P3.3 CIVIC ENGAGEMENT FOR THIS FEIS/FEIR

MassDOT is committed to ensuring comprehensive public awareness and understanding of this complex environmental document so the public and other interested parties can provide informed comments on substantive environmental issues to MEPA and the Corps. MassDOT has published a "Readers' Guide to the FEIS/FEIR" and a Fact Sheet that summarizes MassDOT's understanding of this document's main findings. These documents are available on the project website, www.mass.gov/southcoastrail. Information on public meetings will be posted on the website as well as through the local media and through the project's e-mail list. To sign up for e-mail notifications, please send an email to: jean.fox@state.ma.us.

P4 MASSDOT'S PREFERRED ALTERNATIVE

The MEPA regulations (301 CMR 11.00) and procedures require that the proponent provide a detailed analysis of "the project" in the DEIR, as well as an analysis of alternatives to the project. The intent of these regulations is for the FEIR to provide sufficient information on the project to allow state agencies to make decisions on their actions (funding and environmental permits).

MassDOT has identified the Stoughton family of alternatives as the Commonwealth's preferred corridor for the South Coast Rail project. The FEIS/FEIR presents an evaluation of the environmental consequences of four alternatives (Stoughton Diesel, Stoughton Electric, Whittenton Diesel, and Whittenton Electric) to support the Corps' decision-making process consistent with the Section 404(b)(1) guidelines.

MassDOT has chosen to identify a preferred corridor in the state portion of this FEIS/FEIR to facilitate review of the South Coast Rail project under MEPA. The Stoughton Alternatives (electric and diesel modes) would extend existing Stoughton Line commuter rail service to Fall River and New Bedford using existing commuter rail lines to Stoughton Station, restored commuter rail lines from Stoughton Station to Taunton, and existing freight rail lines from Taunton to Fall River and to New Bedford. These alternatives meet the project purpose of more fully meeting the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts, to enhance regional mobility, while supporting smart growth planning and development strategies in affected communities. MassDOT believes this family of alternatives best balances transportation and environmental benefits with environmental impacts.

MassDOT understands that there are many environmental concerns about the Stoughton Alternatives, particularly because this corridor crosses the Hockomock Swamp Area of Critical Environmental Concern (ACEC) on a historic railroad bed. MassDOT has carefully studied these environmental issues and has incorporated a trestle into the design to minimize impacts to wetlands and wildlife. The analysis indicates that the Stoughton Alternatives are permittable. Adequate mitigation will need to be provided, particularly for impacts to wetlands, wildlife habitat, rare species and water quality. Although the Stoughton corridor would have environmental impacts, it provides the greatest transportation benefits and—unlike the other corridors—fully meets the project purpose.

Although the Secretary's Certificate stated that MassDOT had made the case for the Stoughton Route to be the preferred alternative in the FEIR, and further stated that, because the electric option is preferable from an air quality perspective, the Stoughton Electric should be the focus of the FEIR, MassDOT has not identified a preferred mode for the Stoughton Alternatives. Although the electric mode provides more transportation benefit and has substantial transportation, air quality, and climate benefits, it would have greater visual impacts and impacts to historic resources and would be substantially more expensive to construct.

MassDOT believes that the Stoughton Alternative would have greater benefits to the South Coast Rail communities, greater benefits with respect to air quality, and fewer noise impacts (particularly to environmental justice communities) than the Whittenton Alternative. Although the Whittenton Alternative would have slightly less impact to aquatic resources, it would have greater adverse impacts to the upland habitat of state-listed species and to ecological integrity and would have more adverse effects to archaeological resources. The comparison of impacts shows that the Whittenton Alternative would have greater adverse environmental consequences which, if balanced against the small difference in the impacts to aquatic resources, would have more adverse environmental consequences than the Stoughton Alternative.

P5 CHANGES SINCE THE DEIS/DEIR

Several elements of the South Coast Rail project have been advanced since the publication of the DEIS/DEIR, in order to better characterize the project impacts and mitigation measures. These changes are fully described in Chapter 3 of the FEIS/FEIR.

- The design of the track, stations, and layover facilities has been advanced to better address the project's impacts on wetlands and natural resources.
- Wetlands throughout the project corridor were field-delineated, reviewed and approved by the Conservation Commissions or DEP.
- The operating plan was refined to optimize train performance and ridership. New ridership estimates were calculated.
- The overnight layover facility locations were selected as the Wamsutta site in New Bedford and the Weaver's Cove East site in Fall River.
- The proposed Stoughton Station was shifted to the south, with access from Brock Street.
- The proposed Downtown Taunton Station (for the Whittenton Alternative) was shifted north, to a location on Dana Street.

P6 SMART GROWTH EVALUATION PLAN

MassDOT has retained the smart growth language in the Commonwealth's project purpose because transportation and land use planning need to be integrated in order to achieve the full benefits of the investment and to spur sustainable development. Conversely, transportation infrastructure which encourages economic and housing growth is likely to result in uncontrolled growth (sprawl) if not combined with smart growth planning and strategies.

Smart growth means concentrating development in places that are already served by infrastructure and preserving natural areas and their resources. Smart growth development is typically compact, transit-oriented, walkable, and bicycle-friendly, and can include neighborhood schools, complete streets, and mixed-use development with a range of housing choices. Smart growth values long-range, regional sustainability over short-term benefits. Its goals are to achieve a unique sense of community and place; expand the range of transportation, employment, and housing choices; equitably distribute the costs and benefits of development; preserve and enhance natural and cultural resources; and promote public health.

To manage the region's rapid growth and prepare for and maximize the benefit of the new transit service, the South Coast region needs intentional planning for smart growth development and environmental preservation. The scale and geographic reach of the South Coast Rail project offer an unprecedented opportunity to shape growth so that the project helps preserve environmental resources. By partnering with municipalities to jointly plan the transportation project along with local land use, the project can help cluster people and jobs near train stations, opening up new economic development opportunities, while directing growth away from natural areas.

To further these project goals, MassDOT and the Executive Office for Housing and Economic Development created the South Coast Rail Economic Development and Land Use Corridor Plan (the Corridor Plan). The implementation of the Corridor Plan supports the Commonwealth's sustainable development principles, including revitalizing gateway cities and focusing growth in places that make sense.

Section 5.5 of the FEIS/FEIR was prepared by MassDOT in response to requirements in the Secretary's Certificate on the DEIS/DEIR and other comments on the DEIS/DEIR related to the implementation of the Corridor Plan. Section 5.5 is focused on evaluating and monitoring smart growth development in the South Coast region, which is coordinated with the development of South Coast Rail service. The report provides performance metrics for the Corridor Plan and a plan for monitoring and reporting on the Corridor Plan implementation.

Executive Order 525, issued by Governor Deval Patrick in September 2010, provides for the implementation of the Corridor Plan. Executive Order 525 directs state agencies to make infrastructure and land protection investments consistent with the priority areas identified on the Corridor Map of the Corridor Plan. The priority areas include 33 priority development areas (PDAs), 72 priority protection areas (PPA), and two combined PDA/PPAs. Massachusetts' state agencies are now using the Corridor Plan to guide investments in infrastructure and land protection, and to target technical assistance where it is most needed. The Commonwealth is currently concluding a 5-year update of the Corridor Plan, starting with a review of the original 2008 designations and integrating changes that arose during the intervening years, which resulted in recommended changes to some of the PDAs and PPAs. The update process will conclude with a state review later in 2013. A description of the process and the updated mapping can be accessed by visiting SRPEDD's website at www.srpedd.org.

In order to facilitate smart growth planning efforts by communities in the South Coast Region, a total of $939 million in investment was targeted to South Coast cities and towns in FY 2009-2011, and nearly three-quarters of that funding was directed to the PPAs or PDAs outlined in the Corridor Plan. The Executive Order mandates policy commitments made in the Corridor Plan for "Strategic Investments" by committing the Commonwealth to use its discretionary grant funds and its investments in state buildings and infrastructure to support the recommendations of the Corridor Plan.

In order to provide technical assistance to all communities throughout the Commonwealth, the Executive Office of EEA has developed a Smart Growth/Smart Energy Toolkit that provides information and technical assistance to a variety of users, including planners, developers, and designers, who are interested in implementing smart growth principles for individual projects or communities. The Smart Growth/Smart Energy Toolkit provides examples of Massachusetts communities utilizing the individual tools identified in the toolkit to implement smart growth principles, but no examples are provided of comprehensive smart growth planning linked to specific metrics to monitor the implementation of smart growth principles.

According to the Secretary's Certificate on the DEIR, "the evaluation plan should include a monitoring component to assess the accuracy of impacts projections and allow for mid-course corrections and adaptive strategies as needed." These metrics assess impacts such as growth projections, as well as forestland, farmland and wetland impacts that were projected in the FEIR/FEIS for the business-as-usual and smart-growth scenarios with the actual impacts to these resources. The impacts associated with these scenarios would vary depending on the level of implementation of the Corridor Plan. The Evaluation Plan compares predicted impacts with actual impacts to assess the success of the Corridor

Plan. MassDOT would collect data so that it may notify other state agencies and municipalities that have the ability to make "corrections and adaptive strategies" as required by the Secretary's Certificate.

Currently Executive Order 525 mandates policy commitments made in the Corridor Plan for "Strategic Investments" by committing the Commonwealth to use its discretionary grant funds and its investments to target technical assistance and infrastructure investments to priority areas, to the maximum extent feasible. The Executive Order requires annual reporting by directing the Department of Administration and Finance (A&F) to develop a retrospective analysis to measure the consistency of state investment commitments with the Corridor Plan in addition to web-based tracking tool. More than 245 state investment commitments, made between Fiscal year 2009 and Fiscal year 2011 in the South Coast Region, were reviewed as part of A&F's retrospective analysis.

As noted in the Retrospective Report, agencies have undertaken the following implementation actions to ensure compliance:

- Developing a strategic plan, by agency, for implementing the Executive Order, which will include considerations and issues raised in this report;
- Collecting data to report the implementation of the Executive Order by agency, which will be summarized in an annual report;
- Seeking approval from other agencies for investments that are inconsistent with the Corridor Plan (for example, the Executive Office of EEA would need to justify an exception to the Executive Order 525 for land conservation in a PDA); and
- Targeting technical assistance and infrastructure investments to priority areas, to the maximum extent feasible.

In addition to the Retrospective Report and web based tracking tool, the Executive Order also directed A&F to collect and report state investment commitments each year in the region. These commitments will be used to measure consistency with the Corridor Plan. The first annual analysis will be released in Fall 2013.

As part of the monitoring and reporting program, MassDOT would be responsible for the reporting of results of performance metrics evaluation. MassDOT would draft a report, which would be published on MassDOT's website. The first report would be published approximately four years after the commencement of South Coast Rail service. Subsequent reports would be available every three years after this first report, for a maximum of 20 years. The first report would include data collected for the baseline year (the first year of construction of South Coast Rail) and for the subsequent three years. Each subsequent report would include the historical data, as well as data from the additional reporting period.

The Secretary's Certificate specifically requested that MassDOT form a Working Group devoted to the implementation of the Corridor Plan. To meet this requirement, MassDOT convened the Interagency Coordination Group (ICG) Smart Growth Working Group, a subset of the ICG and included representatives from the U.S. Environmental Protection Agency (USEPA), the Executive Office of Housing and Economic Development (EOHED), the Executive Office of EEA, MassDEP, and the RPAs. The purpose of the ICG Smart Growth Working Group was to develop evaluation indicators and metrics. MassDOT worked closely with EOHED and SRPEDD staff to develop the range of metrics. MassDOT convened a

meeting on April 16, 2012, with the Working Group, to present proposed performance metrics. Following the April meeting, MassDOT refined the performance metrics based on the feedback at that meeting and subsequent coordination with the regional planning agencies and EOHED. The Smart Growth Working Group met again on June 27, 2012. At this meeting, MassDOT proposed a monitoring and evaluation plan to assess the accuracy of impact projections and allow for mid-course corrections and adaptive strategies as needed and performance metrics to evaluate the effectiveness of smart growth plans and environmental protection strategies. The monitoring and evaluation plan is summarized in Section 5.5 of this FEIS/FEIR.

P7 REQUIREMENTS OF THE SECRETARY'S CERTIFICATE

This section of the Preface documents how the FEIS/FEIR responds to the requirements under MEPA, as set forth in the Secretary's Certificate on the DEIS/DEIR. The Certificate required that MassDOT prepare a Final EIR in accordance with the general guidance in the MEPA regulations (Section 11.07), including maps, plans and other graphics, environmental impacts, a list of permits required, and a list of all applicable MEPA review thresholds. Table P-1 identifies the major topics of the Certificate, and where specific information required by the Certificate can be found in this FEIS/FEIR. Volume III: Response to Comments provides a detailed response to each of the requirements of the Secretary's Certificate and to public comments.

Table P-1 Summary of the Requirements of the Secretary's Certificate on the DEIS/DEIR

Topic	Requirement	Addressed in FEIS/FEIR Chapter(s) and Section(s)
Wetlands and Biodiversity	Address the requirements of the Wetland Variance	4.16
	Evaluate wetland impacts	4.16
	Update the vernal pool impact assessment	4.14, 4.16
	Evaluate mitigation measures for impacts to wetlands and wildlife habitat	4.14
	Provide detailed information on stream crossings and culverts to enhance wildlife and fish passage	4.14, 4.16
	Evaluate the feasibility of the proposed trestle	4.16
Wetland Mitigation	Identify lands targeted for acquisition for mitigation to protect wildlife habitat and biodiversity	7.0
	Include a detailed wetland mitigation plan	7.0
Endangered Species	Consult with NHESP concerning additional impact analysis	4.15
	Include a detailed quantification of impacts to state-listed species, and a detailed plan for minimization and mitigation of impacts	4.15
	Include a comprehensive description of how MassDOT proposes to meet MESA regulatory requirements	4.15
Fisheries	Evaluate the potential impacts to fishery resources, and explain how the project will be designed to avoid adverse impacts to stocked trout waters.	4.14
Biodiversity	Include additional information on impacts to migratory birds, and measures to protect breeding birds.	4.14
Open Space	Include a detailed plan to avoid and minimize impacts to open space	4.10
	Include an update on consultations with the National Park Service concerning the Taunton River	4.10, 8.0

Topic	Requirement	Addressed in FEIS/FEIR Chapter(s) and Section(s)
	Describe proposed measures to avoid or minimize construction and operational noise impacts to wildlife in the Acushnet Cedar Swamp	4.10
	Demonstrate compliance with the EEA Article 97 Land Disposition Policy	4.10, 8.0
Layover Facilities	Expand on the analysis of layover facilities with detailed plans and a comparative analysis of environmental impacts.	3.0
	Identify permit requirements and compliance with applicable regulatory requirements, including Chapter 91 and requirements for work within a Designated Port Area.	3.0, 4.18
	Include clear commitments to specific measures to minimize or mitigate impacts, particularly visual impacts to the Taunton River.	3.0, 4.5, 7.0
Stations	Include additional information on feeder bus or shuttle bus service to the stations.	3.0
	Include additional information on station design, including analysis of decked parking, environmentally sensitive site design, and updated information on potential TOD.	3.0
	Update the ridership estimates as applicable.	3.0
	Provide additional information on pedestrian and bicycle access	3.0
Stormwater	Describe how the project will comply with the Massachusetts Stormwater Standards.	3.0, 4.17, 8.0
	Include a detailed evaluation of environmentally sensitive site design and low impact development practices.	3.0, 4.17
	Include information on stormwater peak runoff rates	3.0, 4.17
	Include details on proposed stormwater management along the proposed rail tracks.	3.0, 7.0
	Include a detailed description of the proposed stormwater management system for all components of the project.	3.0, 4.17
Coastal Zone	Describe project consistency with DPA uses and compatibility issues with regard to coastal zone protection.	4.18, 8.0
Chapter 91	Consult with MassDEP and provide more detailed plans concerning the Chapter 91 status of stations and layover facilities.	4.18
	Include analysis and mitigation as applicable to support a Public Benefits Determination.	4.18
	Identify and describe all components of the project requiring Chapter 91 licensing, and how the project will meet licensing standards.	4.18, 8.0
Air Quality	Include an evaluation of alternative fuels for the feeder bus services and describe specific commitments that MassDOT will make to contribute toward VMT and GHG emissions reductions through the feeder bus system.	4.9
	Reiterate the construction-related mitigation measures as part of a comprehensive mitigation plant.	4.9, 7.0
	Identify design and operational features to promote the reduction of GHG emissions associated with TOD and induced growth.	4.9
Noise and Vibration	Include a detailed evaluation of those locations that will experience noise impacts, and commitments to specific mitigation measures.	4.6, 7.0

Topic	Requirement	Addressed in FEIS/FEIR Chapter(s) and Section(s)
	Include a detailed mitigation plan.	
	Compare estimated vibration levels to existing conditions and describe the actual change in vibration that would be experienced. Include a mitigation plan with clear and specific commitments to address vibration impacts.	4.7, 7.0
Environmental Justice	Include a list of specific mitigation commitments to address noise and vibration impacts to EJ neighborhoods.	4.4, 7.0
	Include an update on the investigation of potential adverse effects on any traditional cultural properties of significance to Native American tribes.	4.8
	Include a discussion of how EJ populations may be affected by increased property values and how this will be addressed by MassDOT.	4.4
Cultural Resources	Include an update on historical and archeological studies, and an update on consultations with the MHC and local historical societies.	4.8
	Expand on the analysis in the DEIS/R with a detailed mitigation plan for impacts to significant historical and archaeological resources.	4.8, 7.0
	Include an update on consultations with Native American Tribes and describe potential impacts to properties of significance to the tribes.	4.8
Traffic and Safety	Evaluate the potential for increases in accident rates at grade crossings and identify specific measures to protect public safety.	4.1
	Revise the traffic mitigation plans as necessary based on further analysis.	7.0
Corridor Plan	Include an update on the status of implementation of the Corridor Plan and explain how it will be implemented.	5.5
	Develop a long-term Smart Growth Evaluation and Environmental Stewardship Plan, including metrics to evaluate how effective the project is in furthering social equity and environmental justice.	5.5
Section 61 Findings	Include revised Section 61 Findings.	7.0
Mitigation	Include a separate chapter on mitigation measures, which should include a table of all mitigation commitments as well as the revised Section 61 Findings.	7.0
Response to Comments	Include responses to comments to the extent that they are within MEPA jurisdiction.	Volume III
Circulation	The FEIR should be circulated in compliance with Section 11.16 of the MEPA regulations, and copies should be sent to the list of “comments received” below. A copy of the FEIR should be made available for public review at the Public Libraries in the South Coast region municipalities.	8.0, 9.0

1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

On May 8, 2008, the Massachusetts Executive Office of Transportation and Public Works (EOT) (currently known as the Massachusetts Department of Transportation, or MassDOT) submitted an application to the U.S. Army Corps of Engineers (USACE or the Corps) under Section 404 of the Clean Water Act and potentially Section 10 of the Rivers and Harbors Act of 1899 for a Department of the Army (DA) permit to discharge fill material into waters of the United States (U.S.), including adjacent wetlands, incidental to the construction of new public passenger rail (or other public transportation) facilities connecting the terminal stations of Fall River and New Bedford with South Station in Boston, Massachusetts (the project). MassDOT (the project sponsor and state lead agency) and the U.S. Army Corps of Engineers (the federal lead agency) have evaluated several alignment and mode alternatives to implement this transit service over a distance of approximately 50 to 60 miles.

Environmental review under the National Environmental Policy Act (NEPA) and Massachusetts Environmental Policy Act (MEPA) is being conducted jointly. The Notice of Availability for the Draft Environmental Impact Statement (DEIS)/Draft Environmental Impact Report (DEIR) for the South Coast Rail Project was published in the Federal Register on March 25, 2011.[1] USACE also issued a Public Notice on March 23, 2011, in conjunction the public notice on the DEIR published in the MEPA Environmental Monitor. Approximately 270 written comment documents were submitted during the public review period of the DEIS/DEIR, with additional comments provided public hearings in New Bedford and Mansfield. The Massachusetts Secretary of Energy and Environmental Affairs approved the DEIR on June 30, 2011 and outlined information required in the Final Environmental Impact Report (FEIR).

This Final Environmental Statement (FEIS)/FEIR addresses comments on the DEIS/DEIR and provides updated environmental impact analyses to account for changes in the design of the alternatives since the DEIS/DEIR. The FEIS/FEIR also documents compliance of the Applicant's preferred alternative with the U.S. Environmental Protection Agency Guidelines for Specification of Disposal Sites for Dredged or Fill Material promulgated pursuant to Section 404(b)(1) of the Clean Water Act (Section 404(b)(1) Guidelines), at Title 40 of the Code of Federal Regulations Part 230.10 *et seq*.

1.2 PROJECT PURPOSE AND NEED

1.2.1 Purpose of the Project

MassDOT's stated purpose is "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts, and to enhance regional mobility, while supporting smart growth planning and development strategies in the affected communities."

As part of its review of the Department of the Army (DA) permit application, the USACE is required to evaluate the proposal with regard to the U.S. Environmental Protection Agency (USEPA) *Guidelines for Specification of Disposal Sites for Dredged or Fill Material* (USEPA Guidelines) at Title 40 of the Code of Federal Regulations, part 230. The basic project purpose is examined by the Corps to determine whether

[1] https://www.federalregister.gov/articles/2011/03/25/2011-7070/notice-of-availability-of-the-draft-environmental-impact-statement-for-the-proposed-south-coast-rail

the project is water-dependent. A project is water dependent if it requires access or proximity to, or siting within, a special aquatic site[2] in order to fulfill its basic purpose. The Corps has determined that the basic project purpose for the MassDOT proposal is: "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts." Since ground-based public transportation does not fundamentally require siting within a special aquatic site to meet this basic project purpose, the USEPA Guidelines stipulate that practicable alternatives are (1) presumed to exist and (2) presumed to be less environmentally damaging than the proposed action, unless clearly demonstrated otherwise.

The overall project purpose is used by the USACE to evaluate whether there are less environmentally damaging practicable alternatives available. The 404(b)(1) Guidelines state that an alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of *overall* project purposes [(40 Code of Federal Regulations (CFR) 230.10(a)(2)]. This evaluation applies to all waters of the United States, not just special aquatic sites.

Determination of the overall project purpose is the USACE's responsibility; however, MassDOT's needs and the type of project being proposed are considered by the USACE in reaching this determination. The overall project purpose is defined by the USACE as: "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, MA, and to enhance regional mobility." This definition is specific enough to define MassDOT's needs, but not so restrictive as to constrain the range of alternatives that must be considered under the USEPA Guidelines.

For purposes of the current NEPA analysis, USACE considers and expresses the proposed project's underlying purpose and need from a public interest perspective when appropriate, but generally focuses on MassDOT's purpose and need statement. The Council on Environmental Quality (CEQ) regulations at 40 CFR 1502.13, stipulate that the EIS purpose and need statement "shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." The USACE exercises independent judgment in defining the purpose and need for the project from both MassDOT's and the public's perspectives. The purpose and need as independently determined by the USACE is: to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, MA, and to enhance regional mobility.

1.2.2 Need for the Project

The current transportation system connecting Southeastern Massachusetts with Boston and internally is primarily a highway system and characterized by a lack of transportation mode choice, especially public transit. The highway system is composed of major, limited access state routes, regional highways, and local roadways (Figure 1.2-1). As the population in the South Coast region and employment in the Boston area have grown, the demands on the roadway system linking Southeastern Massachusetts to Boston and the rest of the region have increased, as reflected by increased traffic volumes, resulting in traffic congestion and adverse effects on air quality, climate change and transportation safety. Projected regional growth and the trend of commuters to locate to areas further away from the Boston metropolitan core will exacerbate the existing problems and affect an increasing number of people.

Although important investments in regional transportation facilities and services are planned and being implemented, they are localized and would not fundamentally address the lack of regional mobility and

[2] 40 CFR Part 230 Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material. Subpart E--Potential Impacts on Special Aquatic Sites.

service quality. Expansion of the existing South Coast transit services (bus, taxis, park-and-ride and vanpool) is limited by the roadway congestion.

In consideration of the above, MassDOT therefore proposes enhancement of public transit connections (collectively known as the South Coast Rail Project) to improve transportation between New Bedford/Fall River and Boston and between South Coast cities.

The South Coast Rail project is proposed by MassDOT as part of a comprehensive effort to achieve a series of broad transportation and development goals, as well as specific objectives for improving the quality of transportation services and the equity of the distribution of services within the state. These goals and objectives have been developed by MassDOT over several decades as part of both broad-based policies and specific regional documents, including the *GreenDOT Policy Directive* (2010), *South Coast Rail Plan for Action* (2007), *MBTA Program for Mass Transportation* (2003, 2010 Draft Update[3]), *Toward a New Growth Policy for Massachusetts* (1977) and *Boston Transportation Planning Review* (1970-1973). In addition to statewide plans, regional transportation goals provide a basis for evaluating options for improvement of transportation services and facilities in the South Coast region. These regional goals are included in the 2007 Regional Transportation Plans for New Bedford/Fall River/Taunton Region (adopted by the Southeastern Regional Planning & Economic Development District - SRPEDD); the Brockton Region (adopted by the Old Colony Planning Council - OCPC) and the Boston Region (adopted by the by Metropolitan Area Council - MAPC). The long-term transportation plans of the region support the development of transportation improvements that enhance accessibility, increase mobility, encourage alternatives to automobiles, and provide a more equitable distribution of transit services.

A key component of MassDOT's South Coast Rail proposal is Smart Growth, as it integrates two needs identified by MassDOT for the South Coast region that are related to transportation: *economic development* and *environmental preservation*. Southeastern Massachusetts has been the fastest growing region in the Commonwealth for many years both in terms of population and housing units and this growth has been characterized by development sprawl in exurban areas resulting in the loss of farms, fields and forests and damages to the character of the historic villages and cities within the region. At the same time, the historic cities of Fall River and New Bedford have seen a decline in population and economic vitality and their economic growth has been constrained by poor transportation access to the Boston employment market**.**

MassDOT's intent is for the South Coast Rail project to provide opportunity to generate new economic development, including that resulting from improved access from New Bedford and Fall River to labor markets in Boston and reverse commute access from areas such as Taunton to New Bedford and Fall River, while shaping this growth so that the project helps preserve environmental resources. The South Coast Rail project envisions clustering people and jobs near transit facilities in conjunction with local land use planning, thereby reducing the potential for sprawl and loss of open space. MassDOT is implementing the South Coast Rail smart growth initiatives in partnership with municipalities.

[3] http://www.ctps.org/bostonmpo/4_resources/1_reports/1_studies/3_transit/pmt.html

1.3 REGULATORY CONTEXT OF THE ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

This document has been prepared to comply with the requirements of NEPA, the CEQ regulations for implementing NEPA, (Title 40 CFR Parts 1500-1508), and the USACE Regulatory Program NEPA implementing regulations at Appendix B to 33 CFR Part 325. On May 7, 2008, the USACE determined that an EIS is required for this proposed project because of the project's potential to significantly affect the quality of the human and natural environment. The purpose of this EIS is to assess the environmental impacts associated with the construction and operation of transit enhancements between Fall River/New Bedford and Boston proposed by MassDOT.

Pursuant to its responsibilities under Section 404, the USACE, therefore, has a responsibility to review permit requests seeking authorization to discharge dredged or fill material into all waters of the United States. The USACE review considers MassDOT's purpose and need from a public interest perspective, which involves more than an evaluation of impacts to the aquatic environment. Once the project has been determined to comply with the USEPA Guidelines, the project must also be evaluated to ensure that it is not contrary to the public interest. The district must evaluate the project in light of specific factors listed in 33 CFR 320.4(a) (1), other relevant public interest factors, and the interests of MassDOT to determine the overall balance of the project with respect to the public interest.

The USACE is neither a proponent nor opponent of any proposal. The decision to issue or deny a permit is based, in part on the weighing and balancing of the public interest factors. In order to issue a permit, the District Engineer must determine that it would not be contrary to the public interest (33 CFR 320.4(a)). Further, the USEPA Guidelines prohibit the issuance of a permit if the discharge is not the least environmentally damaging practicable alternative, or would cause or contribute to significant degradation of waters of the United States (40 CFR 230.10(a)(4)).

The proposed project is subject to review by the Commonwealth of Massachusetts under the MEPA because it is being undertaken by a state agency and because it meets or exceeds the review thresholds set forth in the MEPA regulations, including thresholds for a mandatory Environmental Impact Report (EIR). MEPA imposes a requirement on project proponents to understand and fully disclose the potential impacts of a project, both positive and negative; to study feasible alternatives to a project; and to avoid, reduce, or mitigate environmental impacts to the maximum extent feasible. Because the proposed project is being undertaken by a state agency MEPA jurisdiction is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause damage to the environment as defined in the MEPA regulations.

In order to streamline the environmental review process and to facilitate public involvement, MEPA and the USACE are coordinating review of a joint EIS/EIR with the intent to provide the information and analysis required for both federal and state review.

Additional state approvals, reviews and permits required for the project include a Water Quality Certification pursuant to Section 401 of the Clean Water Act, and a Chapter 91 License[4] and a Variance under the Wetlands Protection Act (WPA) from the Massachusetts Department of Environmental Protection (MassDEP). Other permits or approvals required for the project include a Conservation and Management Permit from the Natural Heritage and Endangered Species Program (NHESP). The project

[4] Massachusetts General Law (MGL) Chapter 91. The Massachusetts Public Waterfront Act. Regulatory program pertaining to tidelands and other waterways.

is subject to review by the Massachusetts Historical Commission and the Office of Coastal Zone Management. The project is also subject to the MEPA Greenhouse Gas Emissions Policy and Protocol.

1.4 ALTERNATIVES

1.4.1 Alternatives Development

This section explains the process that led to the alternatives that are evaluated in this FEIS/FEIR. The alternatives analysis process included review of 65 potential alternatives during the scoping process, detailed transportation and environmental impact analyses of seven build alternatives in the DEIS/DEIR, and post-DEIS/DEIR technical studies and interagency coordination. Throughout the alternatives analysis process public, agency and stakeholder input was taken into consideration in the development and evaluation of alternatives, through the federal process, the state environmental review process and public involvement efforts. The Interagency Coordinating Group (ICG)[5] provided an opportunity for input into the technical analyses for the DEIS/DEIR and was also consulted during the FEIS/FEIR process.

An overview of key steps in the alternatives analysis process is provided below, with further detailed information being provided in Chapter 3, *Alternatives*.

1.4.1.1 Initial (PRE-DEIS/DEIR) Alternatives Analysis Overview

An initial range of 65 potential alternatives was identified by reviewing previous studies and soliciting input from the MBTA, the Interagency Coordinating Group, the Commuter Rail Task Force,[6] and interested stakeholders through an extensive civic engagement process conducted by MassDOT. The alternatives are described in detail in the Analysis of South Coast Rail Alternatives: Phase 1 Report, Appendix 3.1-A to this FEIS/FEIR.

These alternatives also included several different components along five main corridors:

- The Attleboro route (using the active freight rail lines from New Bedford and Fall River to Attleboro, then using the Northeast Corridor from Attleboro to South Station) with a new track bypass or connecting at the existing Attleboro Station.

- The Mansfield route (using the active freight rail lines from New Bedford and Fall River to Taunton, then using the abandoned rail line north to Mansfield Station, then using the active commuter rail line to South Station).

[5] The Interagency Coordinating Group (ICG) was convened by MassDOT and includes representatives of the United States Army Corps of Engineers; United States Environmental Protection Agency; United States Fish and Wildlife Service; Federal Highway Administration; Federal Transit Administration; National Marine Fisheries Service; Narragansett Indian Tribe; Wampanoag Tribe of Gay Head (Aquinnah); Massachusetts Executive Office of Energy and Environmental Affairs; Massachusetts Environmental Policy Act Office; Massachusetts Bay Transportation Authority; Massachusetts Department of Environmental Protection; Massachusetts Office of Coastal Zone Management; Massachusetts Department of Conservation and Recreation, Areas of Critical Environmental Concern Program; Massachusetts Department of Fish and Game, Natural Heritage and Endangered Species Program; Massachusetts Historical Commission and the Southeastern Regional Planning and Economic Development District.

[6] The Commuter Rail Task Force was formed in 2004 and provides a forum for state officials and local representatives to review and discuss all aspects of the Project and to work toward consensus on strategies and actions to plan ahead for new growth in the region. The Task Force provides advice and assistance to MassDOT and the MBTA in the design of the South Coast Rail Project and in the implementation of the South Coast Rail Economic Development and Land Use Corridor Plan. Its membership includes representatives from the MBTA, regional transit authorities, cities and towns, environmental groups, and business and economic development organizations.

- The Stoughton route (using the active freight rail lines from New Bedford and Fall River to Taunton, then using the inactive rail bed north to Stoughton, then using the active commuter rail tracks to South Station).

- The Middleborough route (using the active freight rail lines from New Bedford and Fall River to the existing Middleborough/Lakeville Station, then using the Old Colony Middleborough Line to South Station).

- The Highway route (using Routes 140, 79, 24, 128, and I-93 to the existing Route 128 commuter rail station, the existing Quincy Adams Red Line station, or South Station).

A step-by-step screening process was used to narrow the range of alternatives. The screening analyses considered the ability of alternatives meet the purpose and need for the project, whether they were practicable to construct and operate, and environmental impacts.

At the conclusion of the ENF review and public scoping process, the Secretary of EOEEA on April 3, 2009 issued a Certificate that specified the analyses, studies, and information to be included in the DEIR and the alternatives to be evaluated:

- No-Build Alternative (Enhanced Bus)

- Attleboro Electric Alternative (Previously referred to as Alternative 1, Option 1B)

- Attleboro Diesel Alternative (Previously referred to as Alternative 1, Option 1A)

- Stoughton Electric Alternative (Previously referred to as Alternative 4, Option 4B)

- Stoughton Diesel Alternative (Previously referred to as Alternative 4, Option 4A)

- Whittenton Electric Alternative (Previously referred to as Alternative 4, Option 4D)

- Whittenton Diesel Alternative (Previously referred to as Alternative 4, Option 4C)

- Rapid Bus Alternative (Previously referred to as Alternative 5 - Rapid Bus)

During the preparation of the DEIS/DEIR a new "Hybrid Alternative" that combined the Middleborough Simple Rail Alternative with the Rapid Bus Alternative was evaluated at the request of EPA. The evaluation indicated that complementing the low ridership of the Middleborough Simple Alternative with the ridership of the Rapid Bus Alternative would result in a combined ridership for the Hybrid Alternative less than that of the Rapid Bus Alternative by itself and just slightly more than the Middleboro Simple Alternative (which was already considered underperforming in terms of ridership). The combination alternative would require much of the infrastructure improvements needed for each individual alternative, resulting in a higher cost of the hybrid alternative than either the Rapid Bus Alternative or the Middleboro Simple Alternative. This would render the cost of the combination alternative impractical (i.e., fewer riders but higher cost of either Rapid Bus or Middleboro Simple alone). This alternative was therefore not advanced for further analysis in the DEIS/DEIR.

Along with the identification of alternative alignments, potential station sites were identified. Potential station locations to serve each of the five public transportation alternatives were identified for each

alternative and evaluated with regard to their ability to meet the Project Purpose, practicability and environmental considerations.

Potential station locations for the South Coast Rail alternatives were initially identified by the Southeastern Regional Planning & Economic Development District (SRPEDD),[7] and screened in an iterative process by the multi-disciplinary project team. SRPEDD staff with input from the public identified a total of 73 rail and bus station locations, some of which overlapped, totaling 55 rail stations and 30 bus stations. The locations identified include stations that are located on all potential rail segments, including the Fall River Secondary, New Bedford Main Line, the rail bed that extends south of the Stoughton Station, Whittenton Branch variation on the Stoughton alternative, Attleboro Secondary, and Middleborough Secondary.

1.4.1.2 Alternatives Analyzed in the DEIS/DEIR

The following alternatives were analyzed in detail in the DEIS/DEIR. The alternatives analyzed in the DEIS/DEIR were distinguished between No-Build and Build. Among the Build Alternatives there was a rail mode and a bus mode. Within the rail mode, there were three different corridors (Attleboro, Stoughton and Whittenton) and two different propulsion alternatives: electrically powered and diesel powered, as follows:

- No-Build (Enhanced Bus) Alternative
- Commuter Rail Alternatives
- Attleboro Alternative
- Attleboro Electric
- Attleboro Diesel
- Stoughton Alternative
- Stoughton Electric
- Stoughton Diesel
- Whittenton Alternative
- Whittenton Electric
- Whittenton Diesel
- Rapid Bus Alternative

The corridor for the Whittenton Alternative was a variant of the Stoughton Alternative. The Whittenton Alternative corridor avoids the Pine Swamp by using the out-of-service Whittenton Branch right-of-way and a portion of the active Attleboro Secondary rail line. It is identical to the Stoughton Alternative corridor in all other respects.

[7] SRPEDD is a regional planning agency serving 27 cities and towns in Southeastern Massachusetts.

During the DEIS/DEIR analysis, conceptual operating plans, capital improvement requirements, capital costs, and operating and maintenance costs were developed for each alternative. DEIS/DEIR alternatives were modeled by the Central Transportation Planning Staff (CTPS) using their regional transportation model, providing quantitative results on the performance of each alternative in terms of ridership, highway/vehicular travel, air quality, and environmental justice. Detailed analyses of environmental impacts (to natural resources, air quality, noise and vibration, historic resources, social and economic impacts among others) were conducted. Smart growth strategies were as identified in the South Coast Rail Corridor Plan were evaluated for all Build Alternatives analyzed in the DEIS/DEIR.

1.4.1.3 Alternatives Eliminated Following the DEIS/DEIR

This section briefly describes the alternatives eliminated following the DEIS/DEIR and the rationale for not advancing these alternatives to this FEIS/FEIR.

Attleboro Alternatives

The Attleboro Alternatives would provide commuter rail service to South Station using the Northeast Corridor, proposed Attleboro Bypass, Attleboro Secondary, New Bedford Main Line, and Fall River Secondary. Both electric (Attleboro Electric) and diesel (Attleboro Diesel) commuter rail options were evaluated for this alternative. The New Bedford route would be 60.4 miles long and the Fall River route would be 57.9 miles long.

Based on the RAILSIM capacity simulations, the Attleboro Alternatives would operate with very poor on-time performance (especially in the evening peak period) (See Appendix 3.1-D). The analysis indicated that the Attleboro Alternatives would be operationally infeasible as they would not meet the MBTA on-time standard in the morning peak and would experience even worse on time performance during the evening peak commute. The Attleboro Alternatives would also contribute to a cascading negative impact on the on-time performance of the entire southerly commuter rail system, including Worcester, Franklin, Needham, and Providence commuter rail lines.

In order to address the operational infeasibility of the Attleboro Alternative, capacity on the Northeast Corridor (NEC) would have to be increased through construction of a fourth track along the NEC between Forest Hills Station and Back Bay Station. An analysis was conducted in the DEIS/DEIR of the construction costs and schedule implications as well as key property and other impacts associated with the construction of a fourth track. The analysis in the DEIS/DEIR (Section 1.4.6.2) indicated that the potential impacts, construction costs and construction schedule and other aspects of the fourth track along the NEC would render implementation of this infrastructure requirement not practicable considering costs, existing technology and logistics in light of overall project purposes. In a previous study, the Federal Railroad Administration (FRA; a cooperating federal agency) also explored the option to expand capacity of the NEC north of Canton Junction Station. However, due to substantial constraints, it was proposed that such capacity expansion end at Forest Hills in Jamaica Plain. In reviewing the RAILSIM capacity simulations conducted for the Attleboro Alternative, the FRA indicated to the Corps during the preparation of the DEIS/DEIR that it considered the Attleboro Alternatives infeasible and appropriate to eliminate from further environmental review/ consideration.[8] Accordingly, the Corps has determined that the Attleboro alternatives are not practicable, after taking into consideration cost, existing technology and logistics in light of overall project purposes (40 CFR 230.10(a)(2)), and therefore, the alternative was eliminated from further consideration in the FEIS/FEIR

[8] Email correspondence from FRA to Army Corps. March 3, 2010.

Rapid Bus Alternative

As proposed at the time of the DEIS/DEIR, the Rapid Bus Alternative would provide commuter bus service to South Station via I-93, Route 140 and Route 24. North of I-495, buses would use a combination of new zipper bus lanes, new reversible bus lanes, two-way bus lanes, existing zipper high occupancy vehicle (HOV) lanes, and existing HOV lanes, along with a short section in mixed traffic. South of the I-495 interchange in Raynham, buses would travel in the general purpose lanes with mixed traffic. The New Bedford route would be 56.4 miles long and the Fall River route would be 51.5 miles long.

This alternative requires improvements to highway infrastructure along Route 24 (construct third lane from Route 140 to I-495, a distance of 5.8 miles; widen Route 24 to accommodate movable barriers; construct zipper bus lane from I-495 to Harrison Boulevard, a distance of 15.4 miles); and Route 128/I-93 (construct reversible bus lane from Harrison Boulevard on Route 24 to Logan Express Lot, a distance of 4.2 miles; and construct two-lane bus roadway from Logan Express Lot to existing HOV zipper lane on the Southeast Expressway, a distance of 1.6 miles). Infrastructure improvements also include constructing, reconstructing, or widening 20 bridges and reconstructing 11 highway interchanges.

In response to the comments received on the DEIS/DEIR, the Rapid Bus Alternative was re-evaluated and modified to attempt to improve ridership performance and eliminate bottlenecks. Multiple alternatives were developed and evaluated based on the criteria established in the DEIS/DEIR. The changes that were selected and became part of the Modified Rapid Bus Alternative are described in detail in Appendix 3.1-E: *Modified Rapid Bus Alternative Technical Memorandum*.

In developing the Modified Rapid Bus Alternative several major constraints and concerns were identified:

- A fully exclusive bus lane (to reduce travel time) could not be feasibly constructed all the way into Boston;
- Because the Modified Rapid Bus Alternative requires the use a section of the existing highway system that is already subject to heavy congestion and is vulnerable to significant delays, the reliability of the Modified Rapid Bus Alternative would be severely impacted, which would negatively affect ridership;
- Annual operating and maintenance costs of the Modified Rapid Bus Alternative would be more than double those of the Stoughton Electric Alternative; and
- The Modified Rapid Bus Alternative would have twice as much wetland impact (in area) as the DEIS/DEIR Stoughton Electric Alternative and approximately 30 percent less air quality benefit based on a reduction of annual carbon dioxide (CO_2) emissions from commuters switching from automobiles to the public transportation options under consideration.
- In sum, the Modified Rapid Bus Alternative would still have substantially lower ridership, much higher cost and greater adverse environmental impact compared to the commuter rail alternatives.

The Federal Highway Administration (FHWA) provided its review of the DEIS/DEIR Rapid Bus Alternative and subsequent related information (including the Modified Rapid Bus Alternative).[9] The role of the Federal Highway Administration (FHWA) as a cooperating agency on the EIS for the South Coast Rail project is to provide special expertise and technical assistance with respect to issues concerning the transportation system. The FHWA commented that "Based on the information provided in the DEIS and related materials, it is our opinion that the analysis of the Rapid Bus Alternative accurately presents the impacts to the transportation corridor and the region. Furthermore, FHWA believes that the impacts to the roadway network, in particular those which degrade service on the Interstate System associated with the Rapid Bus Alternative and its various modifications are unacceptable, and thus the alternative is not a viable option"

In sum, the substantial analysis conducted for the Rapid Bus Alternative during the DEIS/DEIR and subsequent consideration of optimized Modified Rapid Bus Alternatives (see Appendix 3.1-E), including its multiple design variations, indicates very low ridership, fewer regional mobility benefits (interregional links), greater impact on the environment and on the transportation system than the rail alternatives and high cost of the (Modified) Rapid Bus Alternative and its variants. The Corps has thoroughly considered this data and the determination by the FHWA (in its capacity as a Cooperating Agency with technical expertise on this alternative) of this alternative as non-viable. The Corps concludes that, at best, the Modified Rapid Bus Alternative (1) meets the overall project purpose only marginally by generating approximately 1/3 fewer riders than MassDOT's preferred alternative, (2) is unreasonably costly to construct and maintain (more than double the annual operating and maintenance cost of the Stoughton Electric Alternative), and (3) is logistically infeasible to construct in a manner that would not be highly likely to eventually degrade the already stressed Interstate Highway transportation system. Accordingly, the Corps has determined that the Modified Rapid Bus alternative is not practicable, after taking into consideration cost, existing technology and logistics in light of overall project purposes (40 CFR 230.10(a)(2)), and therefore, the alternative was eliminated from further consideration in the FEIS/FEIR.

1.4.2 Description of Alternatives Evaluated in the FEIS/FEIR

This section provides a description of the alternatives evaluated in the FEIS/FEIR: the No-Build (Enhanced Bus) Alternative, the Stoughton Alternative (electric and diesel variants) and the Whittenton Alternative (electric and diesel variants).

An overview of the rail corridors within which the proposed Build Alternatives would be constructed is presented first. The organization of the description of these corridors forms the basis for the characterization of the affected environment and environmental consequences of the rail alternatives in Chapter 4. Figure 1.2-1 provides an overview of the various rail corridors discussed in this section.

A summary of Build Alternatives modes follows the overview of rail corridors.

[9] Letter from FHWA to USACE re: South Coast Rail Project. January 17, 2013.

1.4.2.1 Overview of Build Alternatives Corridors

The "Southern Triangle"

This section, common to all rail alternatives, provides an overview of two components of the transportation system south of Weir Junction, referred to as the "Southern Triangle." These components include the New Bedford Main Line and the Fall River Secondary.

New Bedford Main Line Rail Segment

The New Bedford Main Line is an active rail line running from the Attleboro Secondary at Weir Junction in Taunton to the waterfront piers in New Bedford. The line connects with the Middleborough Secondary at Cotley Junction and the Fall River Secondary at Myricks Junction. The line is in service for freight only at the present time. The line is mostly single track (but was constructed to carry two tracks), with a two-track section north of Cotley Junction. The line was acquired from CSX by MassDOT.

The line passes through some environmentally sensitive areas, including the Assonet Cedar Swamp in Berkley and Lakeville and is adjacent to the Acushnet Cedar Swamp State Reservation in New Bedford. Other constraints include dense development along the line in New Bedford.

Fall River Secondary Rail Segment

The Fall River Secondary is an active rail line running between the New Bedford Main Line at Myricks Junction in Berkley and the waterfront in Fall River. The line is in service for freight only at the present time. The line is all single-track, and was acquired by MassDOT from CSX.

The line passes through some environmentally sensitive areas, including the Assonet Cedar Swamp in Berkley. Other constraints include dense development along the line in Fall River, and large slopes above and below the line in Fall River along the Taunton River.

Northeast Corridor Rail Segment

The Northeast Corridor is an active rail line running between New York and South Station in Boston. The portion of interest for this project runs from Attleboro to Boston. The corridor experiences heavy use, including Amtrak Regional and Acela service, MBTA commuter rail service, and freight rail service. The MBTA Providence Line uses the entire length of this portion of the corridor; the Stoughton Line, Franklin Line, and Needham Lines join farther north at Canton Junction, Readville, and Forest Hills, respectively.

The corridor has at least two tracks on this section, with three tracks from Readville to Boston. There are also two station siding tracks at Attleboro Station. The corridor is electrified, meaning that both diesel and electric trains can operate, and is designed and signaled for high-speed rail operations. The corridor is owned by the MBTA. Train operations are controlled by Amtrak.

Attleboro Secondary Rail Segment

The Attleboro Secondary is an active rail line running from the Northeast Corridor in Attleboro to the Stoughton Line and New Bedford Main Line at Weir Junction in Taunton. The line is in service for freight only at the present time. The line is mostly single track, with a two-track section just east of the Northeast Corridor in Attleboro. The line is currently owned by MassDOT and operated by CSX.

The line runs through some environmentally sensitive areas, including Chartley Pond and the Three Mile River Area of Critical Environmental Concern (ACEC). It also has many grade crossings in downtown Taunton, because it runs directly through the densely developed core of the city.

Stoughton Alternatives Corridor

This section provides an overview of the Stoughton Main Line, the main component of the transportation corridor for the Stoughton alternatives under consideration. Alternatives through Stoughton would also use the Northeast Corridor north of Canton Junction.

The Stoughton Main Line is a rail line running from the Northeast Corridor at Canton Junction to the Attleboro Secondary and New Bedford Main Line at Weir Junction in Taunton. The line is active between Canton Junction and Stoughton Station serving commuter rail on the MBTA Stoughton Line and freight rail to customers in Canton and Stoughton. A short piece of the line north of Weir Junction is active, serving freight only. The remainder of the line, from Stoughton Station to Taunton, is out of service, and some tracks were removed.

The active sections of the corridor are single-track, except at the approach to Canton Junction, where there are two tracks. The corridor is owned by the MBTA, north of Britton Street in Raynham. Parts of the right-of-way north of Longmeadow Road in Taunton were sold and in various public/private ownership. The active freight rail segment north of Weir Junction is owned by MassDOT and operated by the MassCoastal Railroad.

The corridor passes through some environmentally sensitive areas, including Pine Swamp in Raynham and the Hockomock Swamp ACEC in Raynham and Easton. Hockomock Swamp is one of the most important wetlands in the state for rare species habitat and protects regional water quality.

Whittenton Alternatives Corridor

This section provides an overview of the main component of the transportation corridor for the Whittenton alternatives under consideration. Like the Stoughton alternatives, the Whittenton alternatives would use the Northeast Corridor north of Canton Junction to the Stoughton Main Line to the Whittenton Branch. The Whittenton Branch is an out-of-service rail line in Raynham and Taunton, running around the northwest edge of the core of the City of Taunton and connecting the Stoughton Line with the Attleboro Secondary.

The corridor runs through the Hockomock Swamp ACEC in Easton and Raynham, but would avoid impacts to Pine Swamp in Raynham. The Whittenton Branch is currently owned by the MBTA.

1.4.2.2 Description of Build Alternatives Modes

This section discusses the modes used by the FEIS/FEIR alternatives and the operating assumptions used to evaluate each mode.

Diesel Commuter Rail

Diesel commuter rail refers to a fixed-guideway system with steel wheels operating on steel rails, with one or two locomotives pulling a number of passenger coaches; on the MBTA system, trains are generally six to nine coaches. Coaches would be bi-level, to increase capacity. Diesel commuter rail maximum speed was assumed to be 79 mph, the maximum currently operated on the MBTA system.

While the maximum speed would be 79 mph, actual operating speeds would often be lower due to station stops, curves, and other track features.

Electric Commuter Rail

Electrified commuter rail refers to a fixed-guideway system with steel wheels operating on steel rails, with one or two locomotives pulling a number of passenger coaches. For consistency with the MBTA system, trains are assumed to be six to nine coaches. Coaches would be bi-level to increase capacity. Commuter rail locomotives are powered by an overhead electrical contact system. For electric commuter rail, the maximum speed was assumed to be 100 mph, the maximum speed that can be operated without incurring significant signal costs because of the need to signal civil restrictions. While the maximum speed would be 100 mph, actual operating speeds would often be lower due to station stops, curves, and other track features. The primary travel time advantage of electric commuter rail over diesel for this project is faster acceleration when departing stations (savings of approximately 20 seconds per station, see Section 1.4.3.2).

1.4.2.3 No-Build Alternative – Enhanced Bus

Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts; however, existing routes would be enhanced. The No-Build Alternative would improve transit service to Boston from New Bedford, Fall River, and Taunton by adding more buses with smaller capital investments than are proposed in the Build Alternatives (Stoughton Alternative and Whittenton Alternative). The No-Build Alternative is shown in Figure 1.4-1.

Also included in the No-Build Alternative are the expansion of South Station in Boston, the construction of new mid-day layover facilities in the Boston area and the reconstruction of railroad bridges in the New Bedford area. These improvements are proposed based on existing and future needs and would be implemented irrespective of the South Coast Rail alternatives.

1.4.2.4 Stoughton Electric Alternative

The Stoughton Electric Alternative would provide commuter rail service to South Station using the NEC, Stoughton Line, New Bedford Main Line, and Fall River Secondary. Figure 1.4 -2 shows the Stoughton Alternative. The New Bedford route would be 55.0 miles long and the Fall River route would be 52.7 miles long.

A summary of this alternative is provided Table 1.4-1. The Stoughton Alternative would:

- Utilize 15.5 miles of existing NEC track infrastructure between Boston and Canton Junction;
- Require improvements to track infrastructure along the Stoughton Line including:
    - Reconstructing existing tracks from Canton Junction to Stoughton, as double track, a distance of 3.8 miles; and
    - Constructing new tracks on existing right-of-way from Stoughton Station to Weir Junction in Taunton, as one to two tracks, a distance of 16.4 miles;
- Require reconstructing track on the Southern Triangle (common to both the Stoughton and Whittenton Alternatives), including:

- Reconstructing the existing New Bedford Main Line tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction, a distance of 4.9 miles; and single track with three sidings from Myricks Junction to New Bedford, a distance of 14.5 miles; and

- Reconstructing the existing Fall River Secondary tracks from Myricks Junction to Fall River, as single track with four sidings, a distance of 12.3 miles.

- Infrastructure improvements for the Stoughton Alternative also includes constructing, reconstructing, or widening 40 bridges and constructing or reconstructing 46 railroad at-grade crossings.

This alternative would have ten new commuter rail stations (North Easton, Easton Village, Raynham Park, Taunton, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction of two existing commuter rail stations (Canton Center and Stoughton). This alternative would include two overnight layover facilities, one in New Bedford and one in Fall River.

To support electric locomotives, a traction power system would be built and would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

1.4.2.5 Stoughton Diesel Alternative

The Stoughton Diesel Alternative would be identical to the Stoughton Electric Alternative with the exception of the electrical facilities, which would not be required for the diesel alternative.

Table 1.4-1 Summary of Rail Alternatives

	Stoughton Alternative			Whittenton Alternative		
Segment	Length (miles)	Number of Tracks	Number of Sidings	Length (miles)	Number of Tracks	Number of Sidings
Canton to Stoughton Station	3.8	2		3.8	2	
Stoughton Station to Weir Junction	16.4	1-2		17.9	1-2	1
Weir Junction to Myricks Junction	4.9	2-3		4.9	2-3	
Myricks Junction to New Bedford	14.5	1	3	14.5	1	3
Myricks Junction to Fall River	12.3	1	4	12.3	1	4
Total Length (South Station to New Bedford)	55.0			56.6		
Total Length (South Station to Fall River)	52.7			54.3		

1.4.2.6 Whittenton Electric Alternative

The Whittenton Alternative would provide commuter rail service to South Station through Stoughton, connecting to the existing Stoughton Line using the Whittenton Branch and a short segment of the Attleboro Secondary through the City of Taunton. The Whittenton Alternative is shown in Figure 1.4-3. The New Bedford route would be 56.6 miles long and the Fall River route would be 54.3 miles long.

Table 1.4-1 presents a summary of the Whittenton Alternative. This alternative would:

- Utilize 15.5 miles of existing NEC track infrastructure between Boston and Canton Junction;
- Require improvements to track infrastructure along the Stoughton Line, including:
  - Reconstructing existing tracks from Canton Junction to Stoughton, as double track, a distance of 3.8 miles; and
  - Constructing new tracks on existing right-of-way from Stoughton to Raynham Junction, as one to two track sections a distance of 11.9 miles;
- Require constructing new singe track on existing Whittenton Branch right-of-way from Raynham Junction in Raynham to Whittenton Junction;
- Require reconstructing existing Attleboro Secondary tracks from Whittenton Junction to Weir Junction, as a single track with one siding, a distance of 6.0 miles);
- Require reconstructing track on the Southern Triangle (common to both rail alternatives) including:
  - Reconstructing the existing New Bedford Main Line tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction, a distance of 4.9 miles; and single track with three sidings from Myricks Junction to New Bedford, a distance of 14.5 miles; and
  - Reconstructing the existing Fall River Secondary tracks from Myricks Junction to Fall River, as single track with four sidings, a distance of 12.3 miles.

Infrastructure improvements for the Whittenton Alternative also include constructing, reconstructing, or widening 38 bridges and constructing or reconstructing 53 railroad at-grade crossings.

This alternative would have ten new commuter rail stations (North Easton, Easton Village, Raynham Park, Dana Street, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction of two existing commuter rail stations (Canton Center and Stoughton), as well as expansion of South Station. This alternative would include two overnight layover facilities, one in New Bedford and one in Fall River.

To support electric locomotives, a traction power system would be built and would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

1.4.2.7 Whittenton Diesel Alternative

The Whittenton Diesel Alternative would be identical to the Whittenton Electric Alternative with the exception of the electrical facilities, which would not be required for the diesel alternative.

1.4.3 Operations of the Alternatives

1.4.3.1 No-Build Alternative

Commuter Rail Service

Under the No-Build Alterative, no commuter rail service is offered within the South Coast area. Although commuter rail service is offered in nearby southeastern Massachusetts communities by the MBTA, this service is difficult for most residents to access and is approaching or over capacity under existing conditions.

No-Build Commuter Bus Service

Existing commuter bus service to Boston from New Bedford, Fall River, and Taunton is currently provided by three commuter bus carriers: DATTCO provides Boston – New Bedford service; Peter Pan provides Boston – Fall River bus service; and Bloom provides Boston – Taunton service.

These bus companies offer a fare structure that is competitive to commuter rail service. The three commuter bus routes travel through the downtown core of New Bedford, Taunton, and Fall River. The routes all board passengers in the downtown before traveling to other locations to pickup/drop-off passengers at external bus stops/park-and-ride lots and intermediate flag stops. The Fall River commuter bus runs express to Boston with no intermediate stops.

In addition to the private commuter bus service to Boston, two regional transit authorities (RTAs) provide transit service in the study corridor: SRTA operates in New Bedford and Fall River sub-region, and GATRA operates in the Taunton/Attleboro area sub-region. Each RTA shares terminal facilities with commuter bus companies. These authorities share infrastructure and terminals with the commuter bus carriers and provide passengers an intermodal link from other points within the local communities to the Boston commuter bus service.

Detailed information regarding the existing operating schedule of the bus services in the project area is provided in Chapter 3, along with recommendations of operating schedule enhancements. While bus service operations would be improved, no major capital transit improvements serving the South Coast Region would occur under the No-Build Alternative.

1.4.3.2 Rail Alternatives

Commuter Rail Operations

The Stoughton and Whittenton Electric Alternatives have similar operating plans that were developed to meet the current minimum requirements of the MBTA Service Delivery Plan for commuter rail. The infrastructure proposed for each alternative has been designed to support these levels of operation.

The proposed operations would have four peak period trains to each of the terminal stations of New Bedford and Fall River. This translates to approximately 30-minute service on both the Fall River Secondary and the New Bedford Main Line, and an 18 minute headway on the trunk (shared) portion of the route north of Myricks Junction. During the off-peak periods, six additional trains would operate on a 3 hour frequency from the terminal stations and 90 minutes on the trunk portion. This provides 10 round trip trains per weekday from each terminal station.

Both commuter rail alternatives would use the same station stops south of Taunton Depot. By employing a zone-express service pattern (where trains stop at a few stations and then run express), travel times for passengers traveling from Fall River and New Bedford would decrease as compared to those presented in the DEIS/DEIR.

Table 1.4-2 summarizes the total trip time from each terminal station (New Bedford and Fall River) to South Station based on the revised station stopping pattern. These trip times are between 5 and 7 minutes faster than shown in the DEIS/DEIR due to the revised service plan. As shown in the table, the Stoughton Alternative would be 6 to 7 minutes faster than the Whittenton Alternative for service to New Bedford, and 8 minutes faster for service to Fall River.

Table 1.4-2 Average Trip Time Table (hr:min)

	Stoughton Electric Alternative		Whittenton Electric Alternative	
Operation	**New Bedford Trains**	**Fall River Trains**	**New Bedford Trains**	**Fall River Trains**
Peak Period Service	1:17	1:15	1:24	1:23
Non-Peak Period Service	1:16	1:18	1:22	1:26

1 Overall travel times for each branch of the Stoughton and Whittenton Electric Alternatives were developed using the Rail Traffic Controller model.
2 Assumptions were made based on track and signal layout.
3 Express trains may have longer travel times than local trains since they only operate during peak periods.

The average trip times in Table 1.4-2 are based on simulation of the Stoughton Electric Alternative. Diesel Alternatives would add approximately 20 seconds per station due to the additional time diesel locomotives need to accelerate from the stations. Deceleration rates would be identical to those of the Electric Alternatives. It is noted that although its operating plan skips a few stops, the peak period service has a longer travel time due to longer dwell times at each station in order to load and unload passengers during peak commuting hours. The off-peak period service would stop at every station but would have much shorter dwell times and would, therefore, have a shorter average travel time than the peak service.

Feeder Bus

The Feeder Bus plan for the South Coast Rail project is envisioned to connect the urbanized communities in the study area to the South Coast stations. A Feeder Bus network would provide an alternative to driving to stations and would support transit oriented development and other smart growth initiatives in the study area by connecting surrounding areas to the train station. The Feeder Bus network would provide frequent, convenient service connections with trains.

Three regional transit authorities currently provide local bus service within the region: Brockton Area Transit Authority (BAT), Southeastern Regional Transit Authority (SRTA) and Greater Attleboro Taunton Regional Transit Authority (GATRA). The SRTA and GATRA operators use a fleet of buses that accommodate bicycles, which would encourage multi-modal integration for the South Coast Rail project. Current bus operators would provide enhanced Feeder Bus service to the proposed stations for the selected build alternative.

Feeder Bus service would connect the South Coast Rail stations with the services shown in Table 1.4-3.

Table 1.4-3 Proposed Feeder Bus Operations

Station Name	Operator	Route #	Extension Length (miles)	Existing Headway (minutes)	Proposed Peak Frequency
Easton Village	BAT	8	3.0	40	same
Taunton Station	GATRA	7	0.4	30	same
Dana Street Station	GATRA	18	0.3	30	same
Taunton Depot	GATRA	8	0.2	60	same
Freetown Station	SRTA	2	1.0	30	same
Fall River Depot	SRTA	2	0.4	20	same
Kings Highway	SRTA	8	0	45	same
Whale's Tooth	SRTA	1	0.7	20	same
Whale’s Tooth	SRTA	2	0	20	same

Freight Operations

Although future freight demand was not modeled as part of the project, future operating windows for freight trains were included. Freight trains would be allowed to operate on certain sections of track, during specified time periods (see Chapter 3).

Freight service would be restricted to standard freight size and weight, and would not support high-and-wide or double-stack operations. Freight services is anticipated to continue on the track segments where freight is currently provided (on the Stoughton Line north of Stoughton Station, on the Attleboro Secondary, on the Stoughton Line in Taunton between Longmeadow Road and Weir Junction, and on the New Bedford Main Line and Fall River Secondary south of Weir Junction). No future freight service is currently planned on the out-of-service Whittenton Branch or Stoughton Line between Stoughton Station and Longmeadow Road.

1.4.4 Track Infrastructure of the Rail Alternatives

Subsequent to the DEIS/DEIR, MassDOT has advanced the preliminary track design for the Stoughton Alternative and the Whittenton Alternative. All track changes have been minor. The design of bridge structures has been advanced, particularly for the Hockomock Trestle between Foundry Street and the former Raynham Greyhound Park.

1.4.4.1 FEIS/FEIR Track Design

All of the rail alternatives require reconstructing existing active tracks and constructing new tracks either on out-of service or new rights-of-way. The new track infrastructure would consist of new 132RE rail, new rail ties, new stone ballast, subballast and other track material. The horizontal and vertical geometry for the new track has been designed to conform to the applicable design speed for the alternatives in accordance with the MBTA commuter rail design standards and American Railway Engineering and Maintenance-of-Way Association (AREMA) design standards. The alignments have also been designed to minimize impacts to adjacent environmental resources and private properties.

1.4.4.2 Track Infrastructure - Stoughton Alternative

The New Bedford Main Line from Weir Junction in Taunton to the Whale's Tooth Station, and the Fall River Secondary from Myricks Junction in Berkley to Battleship Cove Station, are segments of track common to both commuter rail alternatives as is the track from Raynham Junction to South Station. Only the segment from Raynham Junction to Weir Junction would differ between the alternatives. Except in certain locations, the track would be designed for a maximum authorized speed (MAS) of 100 MPH. Locations which would be designed for less than 100 MPH MAS would be at certain sidings (which would be too short to achieve 100 MPH), and south of the King's Highway Station, where it would be precluded by single track operations.

Stoughton Line

The existing single track commuter rail line would be upgraded and maintained to FRA Class 7. A new second track would be constructed from Canton Junction to the existing Stoughton Station, where existing passenger service ends. A new double track would extend south of Stoughton Station to the proposed North Easton Station. The remainder of the line south to Weir Junction would be single- track, with a 2.2-mile-long double-track section in Raynham, and a 0.6-mile-long double-track section in Taunton. Approaching Weir Junction, an additional 0.4-mile siding track would be provided for freight use only. Weir Junction would also be reconfigured to accommodate four tracks as well as 45 MPH for operations through the curve while maintaining existing rail connections. These track segments are listed in Table 1.4-4.

Table 1.4-4 Track Infrastructure—Stoughton Alternative

Track Segment	Single Track	Double Track	Triple Track	Quadruple Track	Total (miles)
Canton Junction to Stoughton Station[1]	-	3.8	–	–	3.8
Stoughton Station to Raynham Junction[1]	7.1	4.8	–	–	11.9
Raynham Junction to Weir Junction[1]	2.9	1.1	–	0.4	4.5
Weir Junction to Cotley Junction[2]	–	0.7	0.9	–	1.6
Cotley Junction to Myricks Junction[2]	–	3.3	–	–	3.3
Myricks Junction to Battleship Cove[3]	9.4	2.9	–	–	12.3
Myricks Junction to Whale's Tooth[2]	10.1	4.5	–	–	14.5
TOTAL (miles)	29.5	21.1	0.9	0.4	51.9

1 Stoughton Line
2 New Bedford Main Line
3 Fall River Secondary

A frontage road would be constructed in Stoughton connecting to Morton Street to eliminate multiple grade crossings, and a new grade-separated crossing is proposed at Route 138 in Raynham. A trestle section is proposed in Easton and Raynham to minimize environmental impacts to the Hockomock Swamp Area of Critical Environmental Concern.

New Bedford Main Line

The 19.4-mile existing track along the New Bedford Main Line would be upgraded and maintained to FRA Class 7 options. The line would be double-track from Weir Junction to Myricks Junction, with a 0.9-mile third track for freight movements near Taunton Depot Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 mile. The remainder of the line would be single-

track, with the exception of 1.8-mile double-track section in Freetown and a 1.7-mile section in New Bedford. These sidings are required by the operations analysis and also allow flexibility between commuter and freight operations.

Fall River Secondary

The 12.3 miles of existing track along the Fall River Secondary would be upgraded and maintained to FRA Class 7 options. The majority of this line would be single-track with a 0.7-mile double-track segment at Myricks Junction. A 1.0-mile long section of double track would be installed adjacent to the Fall River Golf Club. Three double-track sections are also proposed in Freetown and Fall River, at 0.6, 0.3, and 0.2 miles long, respectively, to allow flexibility between commuter and freight operations.

1.4.4.3 Track Infrastructure - Whittenton Alternative

The route for the Whittenton Alternative is similar to the Stoughton Alternative except in Raynham and Taunton. The New Bedford route would be 56.6 miles long and the Fall River route would be 54.3 miles long. This alternative would extend through the out-of-service Stoughton Line, as previously described, and connect to the out-of-service Whittenton Branch at Raynham Junction. The Whittenton Branch would extend south and west to the Attleboro Secondary at Whittenton Junction. Along the Attleboro Secondary, the Whittenton Alternative would extend to Weir Junction in Taunton. South of Taunton, the alternative would continue on the New Bedford Main Line and Fall River Secondary track, identical to the Stoughton Alternative.

Track infrastructure improvements would include 3.6 miles of new single-track on the Whittenton Branch and 2.2 miles of single-track reconstruction on the Attleboro Secondary with a 0.3-mile siding reserved for the proposed Dana Street Station. Improvements on the Stoughton Line between Canton Junction and Route 138 in Raynham would be the same as the Stoughton Alternative. Table 1.4-5 summarizes the track infrastructure improvements along the Whittenton Alternative.

Table 1.4-5 Track Infrastructure—Whittenton Alternative

Track Segment	Single Track	Double Track	Triple Track	Quadruple Track	Total (miles)
Canton Junction to Stoughton Station[1]	–	3.8	–	–	3.8
Stoughton Station to Raynham Junction[1]	7.1	4.8	–	–	11.9
Raynham Junction to Whittenton Junction[2]	3.6	–	–	–	3.6
Whittenton Junction to Weir Junction[3]	2.2	0.3	–	–	2.5
Weir Junction to Cotley Junction[4]	–	0.7	0.9	–	1.6
Cotley Junction to Myricks Junction[4]	–	3.3	–	–	3.3
Myricks Junction to Battleship Cove[5]	9.4	2.9	–	–	12.3
Myricks Junction to Whale's Tooth[4]	10.1	4.5	–	–	14.5
TOTAL (miles)	32.4	20.3	0.9	0.4	53.5

1 Stoughton Line
2 Whittenton Branch
3 Attleboro Secondary
4 New Bedford Main Line
5 Fall River Secondary

1.4.5 Grade Crossings

The majority of existing public grade crossings on the active railroad rights-of-way have automatic grade crossing gates and flashers installed. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems. Trains would use horns when they approach grade crossings, which is MassDOT's standard highest level of warning. Sounding a horn while approaching a grade crossing is a well-proven and effective method of providing warning of an approaching train. MassDOT is not proposing Quiet Zones for noise mitigation and is committed to designing the South Coast Rail project grade crossings to the safety standard provided by the Federal Railroad Administration (FRA).

Grade crossings would be closed or consolidated whenever feasible. Private grade crossings would be closed, gated, and locked if possible; if not, new AHCW systems would be installed. At a minimum each public grade crossing would consist of automatic gates, LED flashers, and an electronic bell. Where required, this standard arrangement may be supplemented with additional equipment such as additional gates and cantilevered flashers to optimize visibility for the roadway approaches.

A summary of the number of grade crossings by alternative is provided in Table 1.4-6.

Table 1.4-6 Summary of Public Grade Crossings by Alternative

Commuter Rail Alternative	Existing Active Grade Crossings	Existing Grade Crossings Recommended for Closure	Proposed New Grade Crossings[1]	Total Proposed Grade Crossings
Stoughton Alternative	31	3	15	43
Whittenton Alternative	40	3	13	50

1 Includes grade crossings that are existing but not active

1.4.6 Bridges and Culverts

All of the rail alternatives require reconstructing undergrade bridges (railroad over road or river) and overhead bridges (highway over railroad) along the active and restored rights-of-way.

Table 1.4-7 provides a general summary of required bridge improvements for the two alternatives, to enable comparison. The summary includes existing bridges to be reconstructed and new bridges required to restore/provide grade separation or traverse sensitive areas.

Table 1.4-7 Summary of Bridge Improvements by Alternative

Commuter Rail Alternative	Reconstruct Undergrade (Railroad) Bridges	Reconstruct Overhead (Highway) Bridges	New Bridges for Grade Separation or Environmental
Stoughton Alternative	31	3	6
Whittenton Alternative	29	4	5

1.4.7 Signals and Communications

The Signals and Communications design remains the same as described in the DEIS/DEIR. The following sections summarize the design and compare the Stoughton and Whittenton Alternatives.

1.4.7.1 Stoughton Alternative Signals and Communications

The Stoughton Alternative requires a new Positive Train Control (PTC) signal system for the New Bedford Main Line, Fall River Secondary, and the Stoughton Line. Modifications to the existing NEC signal system are limited to updating the signal logic at the Canton Junction Interlocking. These minor improvements would be needed to make the signal logic on the corridor consistent with the signal logic of the new system on the Stoughton Line.

1.4.7.2 Whittenton Alternative Signals and Communications

The Whittenton Alternative requires a new PTC signal system for the New Bedford Main Line, Fall River Secondary, Attleboro Secondary, Whittenton Branch, and Stoughton Line. Modifications to the existing NEC signal system are limited to updating the signal logic at the Canton Junction Interlocking. These minor improvements would be needed to make the signal logic on the corridor consistent with the signal logic of the new system on the Stoughton Line.

1.4.8 Rolling Stock

Both the Stoughton and Whittenton Alternatives would use commuter rail technology on a fixed-guideway system with steel wheels operating on steel rails, with typically a single locomotive pulling (outbound) or pushing (inbound) a number of passenger coaches. On the MBTA system, coaches can be either single level or bi-level. Commuter rail trains would be powered by diesel or electric locomotives, depending on the alternative. The electric locomotives would be powered by a 25 kV/60 Hz overhead catenary system (OCS). The diesel alternatives would not require an OCS.

Table 1.4-8 summarizes the number of new coaches and locomotives required for each commuter rail alternative.

Table 1.4-8 Rolling Stock Requirements[1]

Alternatives	Locomotives	Coaches	Cab Cars
Stoughton	10	72	10
Whittenton	10	72	10

1 Includes spare locomotive, coaches, and cab cars since the MBTA currently does not have electric locomotives.

1.4.9 Electrification System

A new traction electrification system is required to provide electric power to locomotives for the electric commuter rail alternatives. The diesel alternatives would not require these infrastructure improvements.

The new traction electrification system would tie into the existing NEC electrification system with some modifications to that system. The traction electrification system would provide power to the trains from wayside traction power facilities through an overhead catenary system (OCS) that distributes the power

to the trains' pantographs. The pantographs, mounted on the roof of the rolling stock, would collect the electrical power from the OCS, through mechanical contact by sliding under the OCS contact wire. The electrical circuit would be completed back to the source substation via multiple return paths, including running rails and static wires.

Three major elements would make up the traction electrification system:

- Traction Power System, which include traction power substations, switching stations and paralleling stations.
- Overhead Catenary System (OCS), which distributes the electrical power to the rolling stock, and includes the messenger and contact wires, and the associated supporting structures and hardware. The track negative feeder wires are considered associated with the OCS.
- Traction Power Return System, which makes up the running rails, impedance bonds and static wires.

1.4.10 Stations

New commuter rail stations generally would consist of high-level platforms, canopies, commuter parking, and a pick-up/drop-off area for buses and "kiss & ride" that conform to MBTA Commuter Rail Station design criteria and the Americans with Disabilities Act (ADA). Stations are intended to function similarly to the majority of existing MBTA commuter rail stations; they would be unattended and would require self-pay parking. The proposed stations would not include station buildings. The locations of stations under the Stoughton and Whittenton Alternatives are shown in Figures 1.4-2 and 1.4-3, respectively. As shown in Table 1.4-9, the stations are common to both the Stoughton and Whittenton Alternatives, except for the Taunton Station (Stoughton Alternatives only) and the Dana Street Station (Whittenton Alternatives only).

Station locations have remained as shown in the DEIS/DEIR, with the exception of the Stoughton Station and Downtown Taunton Station. Stoughton Station was relocated to eliminate conflicts with traffic in Stoughton Center and to support downtown revitalization efforts. Several alternatives for the relocation of the Stoughton Station were evaluated (see Chapter 3).

Downtown Taunton Station as described in the DEIS/DEIR was replaced by Dana Street Station, due to development of the originally selected site near the GATRA bus terminal since the publication of the DEIS/DEIR. The Dana Street site was chosen as a replacement for the Downtown Taunton station site since it is a sizable vacant parcel along the right-of-way and is proximate to the previously selected Downtown Taunton site.

Table 1.4-9 Summary of Stations

Station Name	Municipality	Station Type	Parking Spaces	Platform Type[4]	Stoughton Alternative	Whittenton Alternative
Canton Center	Canton	Existing	210[1]	Side (2,Low)	x	x
Stoughton	Stoughton	Relocated	636	Side (2)	x	x
North Easton	Easton/Stoughton	New	501	Center Island	x	x
Easton Village	Easton	New	0[2]	Side	x	x
Raynham Park	Raynham	New	432	Center Island	x	x
Taunton	Taunton	New	210	Side	x	-
Taunton Depot	Taunton	New	398	Center Island	x	x
Freetown	Freetown	New	173	Side	x	x
Fall River Depot	Fall River	New	528	Side	x	x
Battleship Cove	Fall River	New	0[2]	Side	x	x
King's Highway	New Bedford	New	360[3]	Side	x	x
Whale's Tooth	New Bedford	New	748	Side	x	x
Dana Street	Taunton	New	477	Side	-	x
TOTAL – NEW STATIONS					10	10
TOTAL – MODIFICATIONS TO EXISTING STATIONS					2	2

1 Existing lot
2 Pick up/Drop off only
3 Shared parking
4 All platforms are single high-level unless denoted otherwise

1.4.11 Layover Facilities

Midday Facilities - The South Coast Rail project would require midday storage in the Boston area, anticipated to be constructed as part of the South Station Expansion Project. The South Station Expansion Project and the need for increased layover facility capacity near South Station is independent of the South Coast Rail Project.

Overnight Layover Facilities - Both of the commuter rail alternatives would require overnight layover facilities along the Fall River Secondary and New Bedford Main Line.

The DEIS/DEIR identified five alternative sites for overnight layover facilities. Church Street and Wamsutta sites were identified on the New Bedford Main Line, and the ISP Site, Weaver's Cove East, and Weaver's Cove West were identified on the Fall River Secondary. The DEIS/DEIR did not identify a preferred site on either branch. Subsequent to the DEIS/DEIR, the alternative sites were reviewed and recommended sites identified on each branch, as documented in the February 2012 Layover Facility Site Selection (provided in Appendix 3.2-E).

On the New Bedford Main Line, Wamsutta was considered the most favorable location to site a New Bedford layover facility as it has less environmental impact than the Church Street site from the perspective of land acquisition, tax revenue loss, wetlands, and hazardous materials. Wamsutta would also be operationally more efficient with its close proximity to the terminal station, saving the project roughly $500,000 annually.

On the Fall River Secondary, Weaver's Cove East was considered the most favorable location for a Fall River layover facility as it has the least environmental impacts of the Fall River sites with the fewest land acquisition requirements, wetland impacts, impacts to cultural resources and to wild and scenic rivers, and from the perspective of encountering hazardous materials. Weaver's Cove East would also be operationally more efficient than the ISP site with its close proximity to the terminal station, saving the project roughly $500,000 annually.

1.4.12 Cost

The estimated capital costs for the rail alternatives are presented as incremental funding needs over a 30-year period, a typical financing period. Capital equipment costs are presented as the incremental cost of the life of the equipment as defined by FTA guidelines. The net result of this analysis is the identification of the annual funding requirements above and beyond the costs already programmed for the horizon year (No-Build Alternative).

Table1.4-10 provides a summary of the cost estimate and analysis for the Stoughton Electric Alternative. The Whittenton Alternative would have a similar cost. Based on the O&M cost estimates developed for the DEIS/DEIR the Diesel Alternatives would be approximately 30 percent lower than the Electric Alternatives.

The Operations and Maintenance Cost (O&M) was calculated for the Stoughton Electric Alternative. This calculation was based off of updated projected service for 2030. The total amount in 2012 dollars is $33,914,000. The O&M cost for the Whittenton Alternative would be $36,210,000. The Whittenton Alternative would have a similar, but somewhat greater cost due to its increased track length. Based on the O&M cost estimates developed for the DEIS/DEIR, the Diesel Alternatives would be approximately three percent lower than the Electric Alternatives.

Table 1.4-10 Stoughton Electric Alternative Capital Cost Summary

Item	
Total Infrastructure Cost	$1,090,568,000
Real Estate Cost	$52,430,000
Professional Services Cost	$147,767,000
Contingency	$345,700,000
Vehicle Cost	$180,970,000
Total	$1,817,435,000

Notes: Total infrastructure costs were estimated in 2012 dollars.
Professional services are 13.55 percent of infrastructure costs without contingency. Professional services include Design, Permitting, Construction Phase Inspection & Project Management.
Contingencies are 31.70 percent of infrastructure costs and include Indirect Soft Costs, Mitigation Contingency, and Construction Contingency.
Escalation was calculated at 3.25percent per year per FTA criteria.

1.5 SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION

This section summarizes the adverse and beneficial impacts of the alternatives and the mitigation measures that would implemented for each resource category, where applicable. For additional and more detailed information on the impacts and mitigation measures, refer to Sections 4.1 through 5.0 of

the FEIS/FEIR. Table 1.5-1 at the end of this Executive Summary provides a summary of direct permanent impacts for all alternatives and resources.

1.5.1 Transportation

1.5.1.1 Ridership

Increased transit ridership is an important indicator of beneficial transportation effects of an alternative and given the purpose of the project also a measure of how well an alternative would be able to meet existing and future demand for public transportation between Fall River/New Bedford and Boston. The rail alternatives would result in 5,670 to 5,240 daily transit boardings in the South Coast region (commuter rail boardings at new stations plus existing commuter bus service boardings). Due to a faster travel time to Boston, the Stoughton Alternatives achieve greater ridership in the Southern Triangle than the Whittenton Alternatives. For example, the Stoughton Electric would have 840 daily boardings at Fall River Depot compared to 750 under the Whittenton Electric Alternative.

The Whittenton Alternatives ridership is also less than the Stoughton Alternatives because the Whittenton alignment does not include the Taunton Station, which has 670 daily boardings under the Stoughton Electric Alternative. The Whittenton Alternative station closest to downtown Taunton (Dana Street) has substantially lower ridership (320 daily boardings under the electric alternative).

1.5.1.2 Travel Times

Since New Bedford/Fall River commuters currently rely on cars and private bus services, an improved quality of service would have to provide a comparable or competitive travel time and improved reliability with respect to existing commuter options during peak commuting periods. The average commuting time by car during rush hour in 2009 was 90 minutes and travel time by car is projected by CTPS to deteriorate further to 100-120 minutes under the No-Build scenario. There would be no measurable change in travel time by car under the Build Alternatives because due to the saturated nature of the corridor, any trips that shift to rail with the Build Alternatives would be replaced and would result in no change to travel time by car. Travel time for the rail alternatives was based on rail operations analysis, which identified the segments of the rail corridors that would operate at top speed as well as segments where speed is constrained due to speed restrictions, geometry, vehicles, power mode, dwell times and number of stations and civil restrictions. Each commuter rail alternative has two overall run times: one for electric locomotives and one diesel locomotives. The primary factor differentiating the travel time performance of the electric vs. diesel option is the greater acceleration time for diesel trains.

The Stoughton Electric Alternative achieves the fastest travel times (77 minutes between New Bedford and Boston during the peak period). The Stoughton Diesel Alternative takes approximately six minutes longer than the electric alternative to travel the same route because of the additional time diesel locomotives need to accelerate from the stations.

The longer route, and the lower speed needed to maintain safety on the sharp curves in Taunton under the Whittenton Electric Alternative, results in a total travel time approximately seven minutes longer than the Stoughton Electric Alternative (84 minutes compared to 77 minutes). The Whittenton Diesel Alternative takes 6.5 minutes longer to travel from New Bedford to Boston than the Whittenton Electric Alternative and has the longest travel time of the rail alternatives.

1.5.1.3 Vehicle Miles Traveled

Reduction in vehicle miles traveled (VMT) as a result of implementing an alternative is an important indicator of beneficial effect of an alternative on the transportation system, as it enhances the transportation system by reducing travel on roadways through shifting trips from automobile to train or bus. Reductions in driving have several environmental benefits, notably cleaner air and fewer greenhouse gas emissions. Fewer cars on the road also eases congestion along highway corridors, resulting in time benefits.

The Stoughton Electric Alternative achieves the greatest reduction in regional daily vehicle miles traveled of all the Build Alternatives, approximately 54,700 VMT per day greater than the Whittenton Electric Alternative. The Stoughton Diesel Alternative has the second greatest VMT reduction, approximately 6.5 percent less than the Stoughton Electric Alternative. With the longest travel time and lowest ridership, the Whittenton Diesel Alternative is also the least effective of the rail alternatives in reducing regional VMT, although it still provides substantial benefits (reduction of 186,306 vehicle miles traveled per day when compared to the 2035 No-Build condition).

1.5.1.4 Intersection Traffic Impacts

The rail service proposed as part of each of the Build Alternatives would affect traffic patterns, particularly in the vicinity of new stations. To varying degrees, all rail alternatives resulted in traffic impacts substantial enough to warrant mitigation. Traffic mitigation measures are proposed at 35 impacted intersections under the Stoughton Alternatives and 32 impacted intersections under the Whittenton Alternatives.

Mitigation for Intersection Traffic Impacts

Traffic impacts will be addressed through mitigation measures including new traffic signals, traffic signal timing adjustment and addition of turning lanes.

1.5.1.5 Railroad At-Grade Crossing Impacts

Railroad at-grade crossings have the potential to cause traffic impacts due to excessive queuing and traffic spillback while the crossing is closed in order to let a train pass. The Whittenton Alternatives would require the largest number (50) of new or reconstructed railroad at-grade crossings. The Stoughton Alternatives would require (43) of new or reconstructed grade crossings. Traffic analyses conducted for the new or reconstructed alternatives indicated that none of the rail alternatives would result in unmitigatable impacts due to excessive queuing and spillback of traffic.

Mitigation for At-Grade Crossing Traffic Impacts

Traffic impacts will be mitigated by roadway reconfigurations and traffic flow improvements. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems.

1.5.2 Land Use and Zoning

The Build Alternatives would all require property acquisitions outside existing rights-of-way to accommodate the new stations and rail infrastructure or bus lanes. The total acreage of property acquisition impacts of the Stoughton Electric Alternative (136.7 acres) and Whittenton Electric Alternative (136.8 acres) are nearly identical. The diesel versions of the rail alternatives result in 2.2

fewer acres of impact because of the lack of need for traction power substations, which would be required with the electric alternatives. Property acquisitions and compensation of affected property owners would be conducted in accordance with federal and state requirements.

1.5.3 Socioeconomics

1.5.3.1 Residential and Business Displacements

Property acquisitions associated with the Stoughton Electric Alternative would require 4 residential displacements and six business displacements. Based on average household size in the affected communities, nine persons would be relocated. Job losses are expected from business displacements resulting from acquisition of privately owned commercial buildings. Based on a review of residential and commercial property availability,[10] communities that would be impacted by residential displacements or business displacements have sufficient real estate capacity to absorb these displacements. Affected property owners would be provided compensation/relocation assistance in accordance with federal and state requirements.

The Stoughton Diesel Alternative would be comprised of the same elements as the Stoughton Electric Alternative, but would not need electrical infrastructure. The property acquisitions needed for the Stoughton Diesel Alternative are therefore 2.2 acres smaller than for the Stoughton Electric Alternative. The other effects to the social and economic environment that would result from the Stoughton Diesel Alternative (such as property acquisitions for stations, layover facilities, right-of-way, property tax revenue loss, residential and business displacements) are identical to those that would result from the Stoughton Electric Alternative.

The Whittenton Electric Alternative would require 3 residential displacements and 6 business displacements. Based on average household size, nine persons would be relocated. Job losses are expected from business displacements resulting from acquisition of privately owned commercial buildings, but are not quantifiable at this time. Based on a review of residential and commercial property availability, communities that would be impacted by residential displacements or business displacements have sufficient real estate capacity to absorb these displacements. Affected property owners would be provided compensation/relocation assistance in accordance with federal and state requirements.

The Whittenton Diesel Alternative would be comprised of the same elements as the Whittenton Electric Alternative but would not need electrical infrastructure; thus the property acquisitions needed for the Whittenton Diesel Alternative would be somewhat smaller than for the Whittenton Electric Alternative. The other effects to the social and economic environment that would result from the Whittenton Diesel Alternative are identical to those that would result from the Whittenton Electric Alternative.

1.5.3.2 Property Tax Revenue Loss

Property tax revenue losses as a result of the Stoughton Electric Alternative are estimated at $197,251 per year, in 2009 dollars; additional property tax revenue losses may result from small and/or partial acquisitions. Property tax revenue losses as a result of the Whittenton Electric Alternative are relatively less and are estimated at $181,351 per year, in 2009 dollars; additional property tax revenue losses may

[10] Online research of residential real estate property availability conducted by reviewing current listings of similar homes (based on zoning of affected properties) in the affected communities at www.realtor.com. Commercial real estate vacancy rates conducted by telephone inquiries to chambers of commerce in the affected communities.

result from small and/or partial acquisitions that were not estimated. The direct property tax revenue losses for affected communities would be insignificant as compared to the total property tax receipts for each town.

1.5.3.3 Neighborhood Fragmentation

Moderate neighborhood fragmentation is expected to result from implementation of the Stoughton Electric Alternative. Along the inactive portion of the Stoughton Line, some residential and commercial activity encroachment into the right-of-way has occurred in Stoughton, Easton, Taunton, and Raynham. The railroad has been out of service for some 50 years between Stoughton Station and Raynham Junction, and nearly 100 years between Raynham Junction and Longmeadow Street in Taunton. Over time, some neighborhoods on either side of the alignment have developed continuity across the inactive railroad bed as residents have used the alignment for pedestrian transit to neighbors or commercial districts within walking distance. Re-establishing rail service would include safety fencing along the railroad right-of-way through high-density residential and commercial districts, preventing such informal use of the railroad bed as a path. Additionally, motorists, pedestrians, and bicyclists would be temporarily delayed at at-grade railroad crossings when trains pass, potentially disrupting car-based transit between neighborhoods.

Moderate neighborhood fragmentation is also expected to result from implementation of the Whittenton Electric alternative. Neighborhood fragmentation within the Stoughton Line portion would be similar to that described for the Stoughton Alternative. The inactive Whittenton Branch has been out of service for some 50 years. However, neighborhoods on either side of the alignment do not appear to have developed substantive continuity across the inactive railroad bed, partially due to the industrial nature of parcels on either side of the corridor, and partially because portions of the corridor in residential areas are located in a cut section with steep-sided banks, wherein disposal of yard waste and other refuse (rather than pathways to promote neighborhood continuity) has been the primary use of the embankment. Motorists, pedestrians, and bicyclists would be temporarily delayed at at-grade railroad crossings when trains pass, but this effect is not expected to impact continuity among neighborhoods along the Whittenton Branch.

1.5.4 Environmental Justice

Adverse effects to environmental justice populations that would result from the South Rail project are similar for all applicable resource topics with the exception of noise and vibration. Among the rail alternatives, the Whittenton Alternatives would impact the greatest number of residences, and the Stoughton Alternatives the least. Additionally, a greater percentage of noise impacts would be experienced by designated environmental justice populations under the Whittenton Alternatives than the Stoughton Alternatives. Under all rail alternatives and on a regional level, adverse noise impacts would not be disproportionately borne by state-listed environmental justice communities. However, on the municipal level, the analysis concludes that state-listed environmental justice populations in Fall River would experience disproportionately high and adverse noise impacts as compared to non-environmental justice populations. This impact would be addressed through mitigation, specifically a combination of noise walls and building sound insulation.

Vibration impacts would be experienced across the region in both designated and non-designated environmental justice communities. Overall, adverse impacts would not be predominately borne by designated environmental justice communities under the Stoughton or Whittenton Alternatives. At the local level, designated environmental justice communities would experience a disproportionately high

share of vibration impacts in Fall River under both the Stoughton and Whittenton Alternatives. Environmental justice communities in Taunton would experience a disproportionately high share of vibration impacts under the Whittenton Alternatives. Identified mitigation measures would be able to offset these impacts. There are also benefits associated with the rail alternatives that would be recognized by all populations regardless of designation. Increased access would reduce travel times to Boston and other employment centers. Average travel time savings from Fall River, Taunton, and New Bedford are greatest under the Stoughton Electric Alternative, followed by the Whittenton Alternative which would improve travel times by 14 percent. The Stoughton Electric Alternative also represents the greatest travel time savings to colleges and hospitals. The Whittenton Diesel Alternative typically represents the least travel time savings of the rail alternatives.

The beneficial effects to environmental justice populations that would result from the South Coast Rail project vary considerably by alternative and community. Property values in environmental justice neighborhoods near stations may increase as a result of improved access to transit and subsequent TOD. If property values get too high, environmental justice populations may be priced out of their current locations. Conversely, property values in environmental justice neighborhoods along the alternative alignments may decrease as a result of increased noise from train operations. Overall, impacts to environmental justice populations due to property value changes are possible, but are too uncertain to predict precisely. Numerous factors other than transit contribute to changes in housing prices, such as the state of the national and regional economy, changes in income, inflation, tax policy and many other factors. Because the impact is speculative and the mitigation measures are beyond the authority of USACE or MassDOT to implement, no mitigation for displacement/gentrification impacts is proposed. Measures local governments can enact to preserve affordable housing in the vicinity of station areas are identified in Section 4.4.3.3.

1.5.5 Visual Resources

The overall impacts to visual and aesthetic resources resulting from improving or constructing the Build Alternatives would not vary considerably between the alternative alignments. Although all alternatives are rated with an overall moderate visual impact, each alternative alignment has at least one element with a substantial visual impact at the local level. The Stoughton and Whittenton Alternatives would substantially impact the visual character in the vicinity of the historic district and historic train depot in Easton, and in currently out-of-service segments of the Stoughton Line and Whittenton Branch for some 15 miles. Public views of the proposed 1.6-mile trestle would be limited throughout the Hockomock Swamp wildlife management area and would have a visual impact; however there is limited public access to this area. All Build Alternatives would have moderate beneficial impacts at the Fall River Depot Station due to new station construction in a developed area; the Stoughton Alternatives would have an additional moderate beneficial impact at Taunton Station. Electric alternatives would have higher visual impacts than diesel alternatives due to the electrical infrastructure requirements (i.e., overhead catenary system and the traction power facilities).

1.5.5.1 Mitigation for Visual Impacts

Generally, mitigation is appropriate where facilities are most visible and present a change to the existing visual environment, but are not outweighed by safety considerations. Mitigating impacts to the visual environment generally involves screening a facility or structure, or blending its design with the surrounding environment.

The proposed visual mitigation measures include siting and designing facilities to minimize changes to the visual landscape, and minimizing vegetation removal along the right-of-way. Mitigation measures such as screening and light minimization would be incorporated during preliminary or final design.

Screening and design methods could successfully reduce and mitigate some potential visual impacts to properties associated with the reactivation of any of the historic railroads for the South Coast Rail project. Impacts would be minimized by siting the power substations and stations where they would reduce changes to the visual landscape, and lighting has been selected to minimize night-sky impacts. However, visual impacts cannot be completely avoided for any alternative.

1.5.6 Noise

The Stoughton Electric Alternative (Stoughton, Southern Triangle - Fall River, and Southern Triangle - New Bedford segments) would result in 1,106 moderate and 341 severe impacts to residential receptors (excluding horn noise). The diesel operations would have similar impacts, with 1,085 moderate and 344 severe impacts.

The Whittenton Electric Alternative (Stoughton partial, Whittenton, Southern Triangle - Fall River, and Southern Triangle - New Bedford segments) would result in 1,232 moderate and 381 severe impacts to residential receptors (excluding horn noise). The diesel operations would have lower impacts, with 1,228 moderate and 367 severe impacts.

Train horns along the Stoughton Alternative would have 628 moderate and 689 severe impacts. The Whittenton Electric Alternative would result in the train horns producing 1,019 moderate and 1,322 severe impacts. The Whittenton alternative results in the highest railroad grade crossing noise impacts.

The No-Build Alternative would not result in any noise impacts.

1.5.6.1 Mitigation for Noise Impacts

Where sensitive land uses such as residences (as defined in the FTA guidelines) are impacted at the Severe Noise Impact Level, the MBTA will provide noise barriers or other noise measures designed to reduce the noise impact, if cost-effective. Such measures will be considered cost-effective by the MBTA if the total cost of the wall or other measure is less than $30,000 per dwelling unit, and the wall is found to be effective in reducing noise levels below the impact threshold.

The MBTA will initially evaluate the severe impact locations to determine if a noise barrier can be provided. Where noise barriers are not cost-effective by the above standard, or where noise barriers cannot provide a sufficient level of noise reduction, the MBTA will consider providing funding for building noise mitigation. The cost-effectiveness limit for building noise mitigation will be $5,000 per dwelling unit per decibel of noise impact projected above the Severe Noise Impact Level (not to exceed $30,000 total).

For the Stoughton Electric Alternative, severe noise impact locations were evaluated to identify the potential noise mitigation measures. A noise analysis was performed in order to develop the Stoughton Electric Alterative Noise Mitigation Plan (NMP) and found that a noise barrier would be the most cost-effective mitigation measure at four locations. In total, 5,500 linear feet of noise barriers costing $1.65 million are proposed for the Stoughton Electric Alternative. For the remaining severely impacted

sensitive receptor locations, building insulation is the most cost-effective noise mitigation for reducing the noise impact associated with the rail operations along the Stoughton Electric Alternative.

A detailed NMP has not been developed for the Stoughton Diesel, Whittenton Electric or Whittenton Diesel Alternatives. As these alternatives would result in noise impacts in many of the same locations as the Stoughton Electric Alternative, noise barriers similar to those described for the Stoughton Electric Alternative would likely be feasible. Building insulation would be used to address severe impacts in locations where noise barriers are not cost effective.

An option for reducing train horn noise impacts under FRA regulations (49 CFR Parts 222 and 22) would be to establish “quiet zones” at grade crossings. In a quiet zone, train operators would sound horns only in emergency situations rather than as a standard operational procedure because of safety improvements made to the at-grade crossings. Establishing a quiet zone requires cooperative action among the municipalities along the rail right-of-way, freight railroads and appropriate federal, state and local agencies. The FRA regulation also authorizes the use of automated wayside horns at crossings with flashing lights and gates as a substitute for the train horn. While activated by the approach of trains, these devices are pole-mounted at the grade crossings, thereby limit the horn noise exposure area to the immediate vicinity of the grade crossing. Although the establishment of quiet zones or the use of wayside horns would be very effective mitigation (eliminating all or nearly all horn noise impacts), considerable design analysis and coordination efforts would be required to determine their feasibility. MassDOT is not recommending quiet zones and the implementation of quiet zones is not within the control of USACE because the application to FRA must be made by the affected local governments.

Noise impacts may still be present after the NMP proposed noise mitigation measures have been finalized. Noise walls can provide a maximum of approximately 10 dBA noise reduction, and usually protect only the yards and ground level floors. Building noise insulation (soundproofing) can provide 10 to 15 dBA of additional exterior-to-interior noise reduction, but does not mitigate exterior noise and the building’s windows must remain closed to maintain effectiveness.

1.5.7 Vibration

Vibration impacts of the Build Alternatives reflect annoyance and would not rise to a level considered to cause structural damage. The vibration impacts from the Build Alternatives are similar because they follow the same track alignment for most of the corridor, except for the section between the Whittenton Branch turnout (Raynham Junction) and Weir Junction. Based on the vibration impact assessment results, the Stoughton Alternatives would impact 369 residences, while 417 residential impacts would occur under the Whittenton Alternatives. The Whittenton Alternatives result in 48 more impacted receptors, with the Attleboro Secondary segment of the Whittenton Alternatives being the primary cause of the greater impacts.

The bus services added as part of the No-Build Alternative would not generate vibration levels sufficient to cause human annoyance.

1.5.7.1 Mitigation for Vibration Impacts

The need for vibration mitigation in a specific location is determined based on the magnitude of the impacts and consideration of other factors such as feasibility and cost-effectiveness. MBTA has developed a noise mitigation policy that is consistent with the FTA guidance and establishes a cost

effectiveness criterion of $30,000 per dwelling unit. MBTA also utilizes this same cost effectiveness criterion ($30,000 per benefited receptor) for assessing potential vibration mitigation measures.

Several mitigation measures were assumed to be incorporated in the project design and were included in the vibration modeling analysis:

- Use of continuously welded rail to minimize vibrations caused by wheels impacting rail joints.
- Ballast (the crushed rock under the tracks) and sub-ballast (gravel base) will be emplaced to standard depths established by the MBTA to reduce transmission of vibration from the tracks to the ground.
- Turnouts will be located at least 100 feet away from homes and other sensitive buildings, to minimize higher vibration levels due to passage of wheels over the gap in turnout frogs.
- Trains and track will be maintained in such a manner as to minimize vibration generated by the trains, including regular wheel re-truing to eliminate wheel flats.

Additional mitigation measures, such as ballast mats (rubber mats placed under the ballast) will be provided where vibration mitigation is justified, and soil conditions are appropriate, as determined by on-site inspection of each potential mitigation location. Ballast mats, which can give vibration reductions of between 3 and 10 VdB, are very effective in attenuating frequencies of greater than 100 Hz found in vibrations near the source, and for track-receptor geometries traveling through dense soil and rock. The vibration analysis identified a total of 369 residences likely to be impacted by the Stoughton Electric Alternative. Based on the length of the ballast mat, and the cost of this mat at $180 per track foot, a mitigation price was determined for each receptor location. As discussed above, only cost-effective mitigation measures under $30,000 were considered. Of the total impacted receptors, 296 (39 locations) were considered to be cost-effective for vibration mitigation. Approximately 33,350 linear feet of ballast mat would be required along the rail corridor at a cost of approximately $6,003,000. The use of "frogs" (sections of railroad track at a switch that guide rail car wheels from one track to the other) with spring-loaded mechanisms, rather than conventional frogs, would eliminate the impact at the receptor located within 225 feet of the switch at Weir Junction.

Along shared segments, the vibration mitigation under the Whittenton Alternatives would be the same as described above for the Stoughton Alternatives (e.g. Southern Triangle and portion of Stoughton Line). For the Whittenton Branch and Attleboro Secondary portions of the Whittenton Alternatives, a total of 6,300 feet of ballast mat costing $1,134,000 was found to be cost effective for these segments.

1.5.8 Cultural Resources

The rail alternatives would all result in direct adverse effects to five above-ground historic properties, including one National Historic Landmark (specifically, the existing Old Colony Railroad Station which is part of the H.H. Richardson National Historic Landmark, located in North Easton). The electric versions of the alternatives would result in greater visual indirect effects to historic resources than the diesel versions because of the overhead electrical infrastructure and traction power substations required for the electric alternatives. The Stoughton Alternative could impact ten known archaeological sites that are eligible for the National Register (NR), compared to eleven archaeological sites under the Whittenton Alternatives.

Each of the alternatives would also have the potential to affect as yet to be determined archaeological resources and areas of archaeological sensitivity (which would require further investigation to determine if archaeological resources were present).

Based on a comparison of the results of the Intensive Archaeological Survey on the Stoughton Line between Route 138 and Weir Junction, and the Whittenton Alternatives within the same section, the Whittenton Alternatives would have greater impacts to archaeological resources recommended as eligible for the National Register.

The Stoughton Alternatives in this section would likely affect three sites: the King Philip Street Site and the Chickering Road site , and the East Brittania Street Site . Each of these sites yielded a low density of quartz chipping debris and other stone tools (a broken rhyolite point tip and an argillite cobble cortex, and a quart scraper). These three sites show evidence of stone tool manufacturing/maintenance.

The Whittenton Alternatives in this section would affect three sites near the northern end of the Whittenton Branch: the Mel's Diner Site, Brown Couch Site, and ATV Site. Each of these yielded a low density of quartz chipping debris, and one granite hammerstone. These sites appear similar to the Pine Swamp sites.

More importantly, the Whittenton Alternatives would likely affect the Cedar Swamp Site, potentially related to a known village site. The Cedar Swamp Site yielded a more complex array of pre-contact materials, including quart chipping debris, an argillite flake, a chert flake, fire-cracked rock, and a "bowl-shaped cultural feature" potentially associated with a hearth.

Based on this information, the Whittenton Alternatives are likely to have greater adverse effects to cultural resources eligible for listing in the National Register of Historic Places pursuant to Section 106 of the National Historic Preservation Act than do the Stoughton Alternatives.

1.5.8.1 Mitigation for Cultural Resources Impacts

Mitigation measures may be considered to avoid, minimize or mitigate the potential impacts on historic and archaeological resources resulting from the implementation of the South Coast Rail project alternatives. Avoidance is the preferred response when an adverse effect is determined. Adverse effects can only be avoided for the No-Build Alternative, which does not meet the project purpose. Neither of the Build Alternatives can entirely avoid direct impacts to archaeological and above-ground resources. Minimization of impact to historic properties or archaeological resources would be focused on reducing the extent of ground disturbance, establishing vegetated buffers, and designing noise barriers and sound insulation to be compatible with the historic setting, and would be addressed in the Adverse Effects documentation for each individual resource.[11]

The proposed project likely would result in unavoidable impacts to significant cultural resources that cannot be addressed through avoidance or minimization. Mitigation through data recovery and other approaches discussed below may include more than one action. The Adverse Effects documents prepared in support of the Programmatic Agreement (Appendix 4.8-A) will outline the mitigation

[11] The Adverse Effects documentation for an individual archaeological site, historic property, or district has to describe the option(s) selected to minimize impact; and has to contain a discussion about the direct/indirect effects of the option on other archaeological sites, districts, and/or historic properties in the option's Area of Potential Effect (APE). In all cases, the archaeologists and historians will have to clearly document the horizontal and vertical boundaries of the archaeological site, historic property, or district in question as part of the Adverse Effects documentation.

approaches that will be taken for each cultural resource including districts. The Adverse Effects documents are commonly referred to as Data Recovery Plans (DRP) for archaeology and Treatment Plans for above-ground historic properties. The plans would be developed after all stages of intensive (locational) survey and, as needed, evaluative testing are completed and the results of the investigations evaluated by the applicable consulting parties.

Specific mitigation commitments for cultural resources will be informed by additional, more detailed archeological survey fieldwork and additional design detail for the preferred alternative and consultation with the applicable consulting parties (including, but not limited to, federal agencies such as the Advisory Council on Historic Preservation, federally recognized Indian Tribes, and the Massachusetts State Historic Preservation Office). In general, the types of mitigation measures that will be considered for above-ground historic resources include engineering methods that reduce noise generation or vibration, and visual barriers that help to minimize aesthetic impacts. For unavoidable adverse impacts, mitigation through data recovery, treatment plans, photographic documentation or other approaches will be considered.

1.5.9 Air Quality

All alternatives comply with the Clean Air Act Amendments (CAAA) and the Executive Office of Energy and Environmental Affairs (EEA) policy on Greenhouse Gas emissions. The ozone mesoscale analysis demonstrated that the Build Alternatives would result in a decrease of volatile organic compounds (VOC) and nitrogen oxides (NO_x) emissions (precursor emissions to the formation of ground level ozone or smog), as compared to the No-Build Alternative.

The Alternatives would incorporate reasonable and feasible mitigation measures to reduce carbon dioxide (CO_2) and greenhouse gas (GHG) emissions consistent with DEP guidelines. All Build Alternatives meet the EEA policy on GHG emissions because they include mobile and stationary source mitigation measures that will reduce the GHG emission from levels expected from a project without mitigation.

1.5.9.1 Mesoscale Analysis Results

The air quality study included a mesoscale analysis that estimates the area wide emissions of VOC, NO_x, CO_2) carbon monoxide (CO), and particulate matter (PM) emissions. The mesoscale analysis calculated the 2035 mobile source emissions from the major roadways in the study area as well as train emissions.

All rail alternatives would reduce emissions of $NO_{X,}$, CO, and CO_2, in comparison to the No-Build Alternative. All of the rail alternatives have a negligible effect on particulate matter emissions. The electric alternatives all have lower emissions than the corresponding diesel alternative for all of the pollutants. This difference is most notable for NO_X, where the emissions for the electric alternative are substantially less than the corresponding diesel alternative (due to the higher NO_X output related to the locomotives burning diesel fuel). The Stoughton Electric Alternative generally results in the greatest reduction in emissions, consistent with the greatest estimated reduction in VMT.

1.5.9.2 Microscale Analysis Results

The air quality analysis evaluated the potential for impact of motor vehicles and train locomotives on hotspot locations around stations. Hotspot locations are typically congested intersections. The microscale analysis followed EPA guidelines and included motor vehicle and train emissions to calculate worst-case concentrations.

The trains that will be used on the rail alternatives could be electric or diesel. The electric trains do not emit air pollutants and will not contribute to air quality impacts on receptor locations. The microscale analysis, which typically focuses on motor vehicle emissions, added the emissions of the diesel commuter rail trains to the intersection receptor locations to calculate the highest concentrations of CO, PM_{10}, and $PM_{2.5}$ (representing a worst-case condition). All of the pollutant concentrations are below (in compliance with) the National Ambient Air Quality Standards (NAAQS). The rail alternatives would not substantially change any of the concentrations of CO, PM_{10}, and $PM_{2.5}$.

The results demonstrate that all alternatives will meet the NAAQS for CO, PM_{10}, and $PM_{2.5}$. The worst-case modeling results indicate that the alternatives will not cause any new violation of the NAAQS, increase the frequency or severity of any existing violations, or delay attainment of any NAAQS.

1.5.9.3 Greenhouse Gas Emissions

The EEA has developed a policy that requires project proponents to identify and describe the feasible measures to minimize GHG emissions. The policy requires quantification of the project's direct and indirect GHG emissions and identification of measures to avoid, minimize, or mitigate such emissions.

The air quality analysis evaluated the motor vehicle and train locomotive GHG emissions and discussed a commitment to using train engine plug-ins and electric block heaters at layover facilities. All Build Alternatives represent a GHG mitigation measure because they are all designed to reduce VMT. All Build Alternatives will reduce GHG emissions as compared to the No-Build conditions. Of the Build Alternatives, the Stoughton Electric Alternative would have the greatest GHG reduction benefit at 60,859 tons of carbon dioxide per year, followed by the Whittenton Electric Alternative at 49,490 tons of carbon dioxide per year. The diesel alternatives would be less effective than the electric alternatives in reducing greenhouse gas emissions, with the Stoughton Diesel and Whittenton Diesel reducing 2035 carbon dioxide emissions by 29,166 and 14,164 tons/year, respectively.

1.5.9.4 Air Toxics

Mobile sources emit "hazardous air pollutants" or air toxics that can cause cancer and other serious health effects. The air quality study qualitatively evaluated the potential for impact due to mobile source air toxics (MSAT).

For each alternative, the amount of MSATs emitted would be proportional to VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for each of the Build Alternatives are lower than that for the No-Build Alternative, because any of the South Coast Rail alternatives will remove vehicles (and therefore reduce VMT) from the study area roadways by shifting mode choice to public transportation (i.e. the South Coast Rail). This reduction in VMT would lead to lower MSAT emissions for the Build Alternatives. The differences in VMT between the various alternatives will result in similar differences in the MSAT emissions.

Based on an FHWA analysis using EPA's MOVES2010b model even if national VMT increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.[12] Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in all cases.

[12] http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm

1.5.10 Protected Open Space and Areas of Critical Environmental Concern

The South Coast Rail project alternatives would use existing railroad or highway alignments to the maximum extent possible, avoiding or minimizing impacts to protected open spaces. Where property acquisition of protected open spaces is necessary, direct mitigation will be required. Once the preferred alternative is selected and final design completed, such direct mitigation would be negotiated with the affected entity.

The area of protected open space and publicly owned parcels within Areas of Critical Environmental Concern (ACECs) required for improving or constructing the project is very similar among the alternatives. For all alternatives, the overall impact (0.16 acre) would be small relative to the total area of protected open space within the South Coast Rail Project area. All of the alternatives would impact considerably less than 0.01 percent of the total area of protected open space.

Legal access to protected open spaces and Areas of Critical Environmental Concern (ACECs) would not be significantly impacted by constructing, reconstructing, or using the railroad alignments, stations, or layover facilities. Current but unauthorized access to protected open space and the Hockomock Swamp ACEC via the MBTA-owned, out-of-service portion of the Stoughton Line would cease.

The No-Build Alternative would not require any new construction or land acquisition and would not directly affect protected open spaces and/or ACECs.

1.5.10.1 Mitigation for Impacts to Protected Open Space and Areas of Critical Environmental Concern

The South Coast Rail project alternatives would use existing railroad or highway alignments to the maximum extent possible, avoiding or minimizing impacts to protected open spaces. Where property acquisition of protected open spaces is necessary, direct mitigation will be required. Once the final design is completed, such direct mitigation would be negotiated with the affected entity.

1.5.11 Farmland Soils

Based on the conservative assessment used to complete the Natural Resources Conservation Service (NRCS) forms, no significant impacts are anticipated for designated farmland soils that would be altered by this project. Note that farmland soils as defined by NRCS are unrelated to the land use of the affected properties—farmland soils can exist in areas where no active farming is occurring. Impacts for each alternative to farmland soils are as follows:

- Stoughton Electric Alternative would result in impacts to 18.6 acres of designated farmland soils;
- Stoughton Diesel Alternative would result in impacts to 16.0 acres of designated farmland soils;
- Whittenton Electric Alternative would result in impacts to 18.8 acres of designated farmland soils;
- Whittenton Diesel Alternative would result in impacts to 16.2 acres of designated farmland soils

Using the USDA scoring system, impacts to farmland soils under all Build Alternatives would not be considered significant under the Farmland Protection Policy Act, and mitigation for these losses would not be required.

1.5.12 Hazardous Materials

Each of the build alternatives under consideration would require acquisition of properties with Recognized Environmental Conditions (RECs; sites with the presence or likely presence of hazardous materials) that would require further investigation. In each case, remediation or soil/groundwater management during construction could be required. The Stoughton, and Whittenton Alternatives each have at least five high impact RECs that were identified, and these alternatives also have the potential to encounter soil or groundwater contamination. Taunton Station on the Stoughton Alternatives, and Dana Street on the Whittenton Alternatives have three and one high impact RECs, respectively, that were identified. Overall, a greater number of RECs were identified for the Whittenton Alternatives (32) than for the Stoughton Alternatives (29).

The Stoughton Alternatives and the Whittenton Alternatives would have environmental benefits. Although sites containing RECs could increase construction costs, there would be an environmental benefit associated with remediating contaminated sites, particularly the station sites with known soil and groundwater contamination such as the Taunton Station site. The alternatives that would have the greatest environmental benefits are the alternatives with the most RECs (i.e., Stoughton Alternatives) since these properties are the most likely to have contaminated environmental media that would be cleaned up for the proposed South Coast Rail project.

Both layover sites would involve acquisition of properties with RECs. Five RECs were identified at the Wamsutta site, none of which are high impact RECs. Five RECs, two of which are high impact RECs, were identified for the Weaver's Cover East Site.

The spill or release of Oil or Hazardous Materials (OHM) in the process of constructing the South Coast Rail project is an unlikely event, and measures would be required to prevent and control any such spills. The construction contractors would implement a Spill Control Program in compliance with the Massachusetts Contingency Plan (310 CMR 40.0000, "the MCP") and MBTA policy. These measures would be employed both at the rail reconstruction sites and station construction sites.

1.5.13 Geology

Soil and rock affected by the Build Alternatives would be excavated and disturbed during construction. Once a Build Alternative is operational, no further potential long-term impacts to the underlying bedrock geology or soils would be anticipated due to the elements of the Build Alternatives.

None of the Build Alternatives would require tunneling or other deep excavation that would significantly affect geological conditions. Most disturbance activities would encompass a relatively small area within or adjacent to previously disturbed areas and infrastructure. These include active rail and out-of-service rail beds (Stoughton line and Whittenton Branch) that have previously been established to be compatible with subsurface conditions. No long-term changes to geologic structures or faults, to bedrock, soils, or geologic stability, to seismicity, or to the rock and soil units surrounding excavations would be expected as a result of the Build Alternatives

No specific impacts with respect to soils or geology would be anticipated under the No-Build Alternative.

No long-term adverse impacts to soils and geology would occur with any project alternatives; therefore, no mitigation will be required.

1.5.14 Biodiversity

All build alternatives would result in the loss of upland habitat, wetland habitat, and vernal pool habitat (including direct and indirect impacts to vernal pools as well as supporting upland habitat used by vernal pool amphibians). All build alternatives would also result in increased habitat fragmentation and exacerbate existing barriers to wildlife movement.

Wetland habitat loss, vernal pool habitat loss and loss of surrounding vernal pool upland habitat would all be greater under the Stoughton Alternatives (12.3, 1.43 and 43.40 acres respectively) then under the Whittenton Alternatives (11.2, and 0.8 and 41.61 acres, respectively). However, in other respects the Whittenton Alternatives would have greater impacts on biodiversity than the Stoughton Alternatives. For example, the Whittenton Electric Alternative would impact 187.98 acres of upland wildlife habitat, over 5 acres greater than the impacts under the Stoughton Electric Alternative (182.27 acres). The University of Massachusetts' Conservation Assessment and Prioritization System (CAPS) model analysis also indicates that the Whittenton Alternatives would have a slightly higher loss of Index of Ecological Integrity (IEI) Units with a total loss of 484.6 versus 474.5 for the Stoughton Alternative.

Each of the rail alternatives would result in habitat fragmentation and associated indirect effects on natural communities. The Stoughton Alternatives would exacerbate fragmentation of wetland and upland communities, particularly through the Hockomock Swamp and Pine Swamp, although the barrier effect in Hockomock Swamp would be reduced by constructing a trestle. The Whittenton Alternatives would also exacerbate fragmentation of wetland and upland communities, particularly through the Hockomock Swamp and along the Whittenton Branch, although the barrier effect would be reduced by constructing a trestle in the Hockomock Swamp.

The No-Build Alternative would not create any new impacts to natural communities or biodiversity.

1.5.14.1 Mitigation for Biodiversity Impacts

Strategies and measures that could be used to mitigate for impacts to biological diversity were evaluated. The assessment considered whether impacts to biodiversity could be avoided or minimized, and whether mitigation measures could be incorporated into the alternatives to mitigate for unavoidable impact.

The Build Alternatives use existing, active rail lines (e.g., New Bedford Main Line, Fall River Secondary and Stoughton MBTA line) where possible to reduce impacts to natural communities. Station and layover facility sites were selected to avoid impacts to sensitive biological resources. Where avoidance is not possible, impacts would be minimized to the best extent practicable. Measures to minimize direct and indirect impacts to biodiversity (plant, wildlife, and aquatic communities) will be developed as part of the mitigation for impacts to wetlands, threatened and endangered species, and water resources. In addition to other minimization measures not yet identified, these measures would include:

- Adjusting the grading to reduce the loss of plant or wildlife communities.
- Evaluating all existing culverts to determine whether replacing a culvert could adversely impact, or benefit, biodiversity.

- Installing new crossing structures within railroad grades and/or between railroad ties to facilitate safe passage of fauna across the right-of-way.

- Using retaining walls to reduce the loss of unique natural communities.

- Replanting disturbed areas.

- Developing and implementing an invasive species control plan within the Hockomock Swamp.

The Stoughton and Whittenton alternatives were designed with specific measures to minimize habitat fragmentation. Both the Stoughton and Whittenton Alternatives include the proposed Hockomock trestle, extending for approximately 8,500 feet. The trestle would maintain habitat connectivity for small terrestrial and aquatic vertebrates and other wildlife and thus minimize impacts to biodiversity. The Whittenton Alternative would further minimize impacts to biodiversity by avoiding the Pine Swamp area in Raynham, which would be crossed by the Stoughton Alternative.

Each of the alternatives presents opportunities to improve wildlife habitat, particularly by reconstructing existing culverts or bridges to improve wildlife or fish passage and reduce fragmentation. In addition, the proposed Hockomock trestle would eliminate unauthorized access to the ACEC by all-terrain-vehicles (ATVs) that have been observed leaving the right-of-way and entering adjacent vernal pools, thereby affecting sensitive (breeding, egg and larval) stages of amphibians, including rare species. The result would be a reduction in adverse effects to these communities that would otherwise continue under the No-Build condition.

1.5.15 Threatened and Endangered Species

There are no species listed on the Federal Threatened and Endangered Species Lists that would be affected by any of the alternatives.

Each of the Build Alternatives could impact eight species listed under the Massachusetts Endangered Species Act, including one salamander (blue-spotted salamander: *Ambystoma laterale*), two turtles (Blanding's turtle: *Emydoidea blandingii* and eastern box turtle: *Terrapene carolina carolina*), one freshwater crustacean (coastal swamp amphipod: *Synurella chamberlaini*), and four insects (mocha emerald dragonfly: *Somatochlora linearis*; Hessel's hairstreak butterfly: *Callophrys hesseli*; pale green pinion moth *Lithophane viridipallens*; and water-willow stem borer moth: *Papaipema cataphracta*), and would result in the loss of migratory route habitat because all rail alternatives require reconstruction of rail lines on out-of service rights-of-way where currently there are none.

The Stoughton and Whittenton Electric Alternatives would have identical impacts to the upland habitat of the Blanding's turtle (12.5 acres) and blue-spotted salamander (7.5 acres). The Whittenton Electric Alternative would have greater impacts to the upland habitat of the eastern box turtle compared to the Stoughton Electric Alternative (13.8 acres compared to 12.6 acres). The Whittenton Alternatives would also have a greater barrier effect on rare species—loss of 3.6 miles of migratory route habitat, compared to 3.2 miles under the Stoughton Alternatives. The relatively higher impacts of the Whittenton Alternatives are due to impacts along the Whittenton Branch, which includes areas surrounded by rare species habitat. The additional barrier effect of the Whittenton Alternatives is specifically attributable to potential impacts to the migration of the eastern box turtle across the Whittenton Branch.

The No-Build Alternative is not expected to create any new impacts to rare species and/or their habitat.

1.5.15.1 Mitigation for Impacts to Threatened and Endangered Species

Proposed measures to be developed in coordination with the Natural Heritage and Endangered Species Program (NHESP) to avoid, minimize and mitigate rare species impacts within the project Study Area are provided in Chapter 7. Proposed project mitigation measures for permanent impacts include:

- Construct wildlife corridors and passages through the rail bed in areas to maintain population continuity for state-listed wildlife, at the locations specified in Chapter 4.14, *Biodiversity*.
- Provide funding or land acquisition to protect up to 25 acres of land potentially used by the Hockomock Swamp population of Blanding's turtle.
- Fund a study of the Hockomock Swamp population of Blanding's turtle to assist NHESP in developing long-term protective measures, if required by NHESP in the Conservation and Management Permit.
- Provide funding or land acquisition to protect up to 11 acres of land potentially used by the Hockomock Swamp population of blue-spotted salamander.
- Provide funding to the NHESP Eastern Box Turtle Mitigation Bank equivalent to protecting up to 17 acres of habitat, or directly protect up to 17 acres of habitat through land acquisition or restriction.

1.5.16 Wetland Resources

Wetland impacts are the principal category of environmental impacts that must be considered for federal Clean Water Act Section 404 permits and variances under the Massachusetts Wetlands Protection Act. In addition to total wetland impacts, wetland fill within ACECs was also quantified, as wetlands within ACECs receive a higher level of state regulatory protection. The Whittenton Alternatives would result in direct permanent impacts to 11.2 acres of waters of the United States (including vegetated wetlands and waterbodies), compared to 12.3 acres under the Stoughton Alternatives. The impacts of the Stoughton Alternatives include some wetlands within and north and south of Pine Swamp. Both the Whittenton and Stoughton Alternatives would affect the same acreage of wetlands within Hockomock Swamp.

It should be noted that although the Stoughton and Whittenton Alternatives both cross the Hockomock Swamp ACEC, direct wetland impacts of these alternatives within this ACEC are actually quite limited (0.2 acre). This is because these alternatives would use the existing railroad grade that already crosses the swamp, which has been in existence since the late 19th Century. In fact, the actual area of impact would be on an existing stream that has overtopped its original banks (i.e. the railroad drainage ditches) and now flows over an approximately quarter-mile portion of the existing railbed.

The No-Build Alternative is not expected to create any new impacts to wetlands.

1.5.16.1 Mitigation for Wetland Impacts

Chapter 4.16, Wetlands, provides a mitigation plan to address unavoidable wetland impacts in accordance with federal and state requirements. Based on USACE requirements, permanent direct impacts of the Stoughton Electric Alternative are estimated to require 31.3 acres of compensatory wetlands mitigation—1.9 acres open water, 2.1 acres emergent wetlands, 1.8 acres scrub-shrub wetlands and 25.5 acres of forested wetlands. The Whittenton Electric Alternative would require 28.4 acres of compensatory mitigation for direct permanent impacts. The mitigation site search discussed in Chapter 4.16 also takes into consideration the mitigation requirements for temporary, temporal and secondary impacts.

A wetland mitigation site search analysis was conducted. Based on GIS analysis and agency review, the lists of sites were narrowed down to those sites with the highest potential value for wetland establishment or restoration. Based on input from the reviewing agencies, five sites were chosen from the preliminary list as having the highest potential for wetland establishment or restoration. Conceptual design was undertaken for these sites, including development of planting plans, wildlife habitat features, construction methods, invasive species control, and monitoring and reporting plans. The identified potential mitigation sites can meet the mitigation goals of the project. Specific sites will be selected by MassDOT in coordination with USACE and other agencies and the design of the selected sites advanced.

1.5.17 Water Resources

All of the Build Alternatives would have the potential to affect waterbodies and drinking water protection areas. The Stoughton Alternatives would not require construction within public water supply Zone 1 Areas (i.e. within 400 feet of the well). The Whittenton Alternatives would require construction within public water supply Zone 1 Areas (i.e. within 400 feet of the well). All of the Build Alternatives would upgrade existing transit corridors, which would have a negligible effect on pollutant loading. The Build Alternatives would upgrade existing transit corridors but would also build new rail lines on disused rail corridors, potentially introducing new pollutant sources in those areas. With mitigation and drainage features in place, none of the Build Alternatives are expected to impair any water resources.

Potential impacts to the Hockomock Swamp would occur due to stormwater discharges to Black Brook, from the Stoughton and Whittenton Alternatives. However, minimal impacts to ACECs from stormwater discharges would occur from the project. None of the above-mentioned discharges are associated with constructed stations, station platforms or parking areas. These discharges would primarily occur from conveyed overland flow from ditches along the railroad, which would carry negligible contaminant loads. None of the proposed actions are expected to impair surface or groundwater resources within the ACEC. Compliance with the Massachusetts Stormwater Management Standards is provided for all stations except Stoughton and Dana Street. Compliance will be documented for these stations (as necessary) during later project design phase phases.

1.5.17.1 Mitigation for Impacts to Water Resources

Proposed station and parking facilities for all alternatives were located on developed sites whenever possible to minimize any increases in impervious area and to avoid introducing new pollutant sources to undeveloped areas. Additional minimization measures to reduce impervious surfaces such as deck parking, the use of water quality swales, narrower streets and green "islands", a reduced building footprint, and alternative (permeable) materials for parking areas, sidewalks and roads at stations will be considered during the design stage of the project. Further minimization along the proposed transit

corridors was not possible, as the corridors themselves were determined by existing and former highway and rail alignments and could not be relocated without substantial increases in impacts to other resources.

All Build Alternatives would require specific stormwater management measures to prevent flooding and protect water quality. All stormwater Best Management Practices will meet or exceed regulatory requirements to suggest mitigation for potential impacts. These BMPs will be further refined during the design stage of the project. With the proposed mitigation measures in place, none of the Build Alternatives would be expected to substantially increase pollutant loading or impair any surface or groundwater resources.

Construction of the Build Alternatives would require a National Pollution Discharge Elimination System (NPDES) construction permit pursuant to Section 402 of the Clean Water Act. NPDES is administered in Massachusetts by the U.S. Environmental Protection Agency, and generally qualifies for a General Permit. The project would be constructed pursuant to a comprehensive Stormwater Pollution Prevention Plan (SWPPP). The SWPPP would describe potential pollutant sources on a site and dictate what best management practices (BMPs) must be implemented to manage stormwater and protect water quality during construction.

1.5.18 Coastal Zone and Chapter 91 Waterways

Depending on the alternative selected, the project is expected to require several licenses for bridges, stations and layover facilities. Additional approvals will be required for certain bridge, track and ballast improvements at existing railroad crossings of non-tidal rivers and streams. The jurisdiction of many of these crossings will be determined during further consultation with DEP and the United States Coast Guard.

The alternatives are anticipated to comply with the policies and principles of the Massachusetts Coastal Zone Management Program (MCZM). The alternatives will support water-dependent industrial uses within the New Bedford and Mt. Hope Bay DPAs by maintaining a critical transportation system supporting these uses.

Section 307(c) of the Coastal Zone Management Act of 1972 requires any non-federal applicant for a federal license or permit to conduct an activity affecting land or water uses in the state’s coastal zone to furnish a certification that the proposed activity will comply with the state’s coastal zone management program. The Build Alternatives would require a Federal Consistency Certification under the Massachusetts Coastal Zone Management Plan from the MCZM Office. It is anticipated that the alternatives would be consistent with the applicable policies.

None of the elements proposed under the No-Build Alternative are located within Chapter 91 or Coastal Zone jurisdiction. Therefore, no impacts would occur.

1.5.19 Indirect and Cumulative Impacts

1.5.19.1 Indirect Impacts

Potential indirect effects (beneficial and adverse) of the Rail Alternatives were evaluated with and without smart growth measures (including TOD). Scenario 1 considers reasonably foreseeable indirect effects from implementing the South Coast Rail project without smart growth strategies, including TOD;

while Scenario 2 outlines a future of smart growth development patterns across the South Coast region wherein housing and jobs are clustered in areas appropriate for development, while preserving important natural resource lands such as fields, forests, farmland, and wetlands.

Each of the three Build Alternatives is anticipated to induce additional growth within the South Coast Region as a result of improved transit access. However, the induced growth from each is relatively small in comparison to the No-Build Alternative, which is projected to increase the number of households by 75,212 by 2035. The Stoughton and Whittenton Alternatives would increase growth by 2,804 households over the No-Build condition, Job growth would be 1,341 greater under the Stoughton and Whittenton Alternatives by 2035 compared to the No-Build Alternative.

The No-Build Alternative and each of the Build Alternatives would result in the loss of land, including undeveloped forest land and farmland, loss of wetlands, and loss of biodiversity value. The differences among the Build alternatives are negligible. Each of the Build Alternatives would also slightly increase the effects of the No-Build baseline growth on water demand, greenhouse gas emissions, and vehicle miles traveled. The Build Alternatives would also slightly increase municipal property tax revenues as a result of new home construction.

Smart Growth

Implementing smart growth measures would not change the overall numbers of households or jobs within the Study Area, but it would re-distribute them to create compact development zones and protect undeveloped land. The savings that would accrue from fully implementing smart growth measures (Scenario 2) would be substantial in many instances. For example, the smart growth scenario would result in saving as much as 3,100 acres of farmland for the Stoughton Alternative (30 percent of the farmland loss in Scenario 1), or 12,189 acres of land (30 percent of the total in Scenario 1). The results are indicative of the benefits of the smart growth measures that could be implemented as part of the South Coast Rail alternatives. To help encourage smart growth development patterns to become reality in the future, MassDOT has developed an implementation plan for the South Coast Rail Economic Development and Land Use Plan, including performance metrics and reporting requirements (see Section 5.5).

1.5.19.2 Cumulative Impacts

Table 1.5-2 includes a summary of the incremental changes to the evaluated resources from the South Coast Rail alternatives that, in combination with past activities or trends and other known current and future projects, would potentially result in a substantive cumulative effect. Because there is no substantive difference between the impacts from rail alternatives' electric- or diesel-powered trains, these options are not included in this summary comparison. Additionally, the impacts from the Whittenton Alternative are substantively equivalent to those from the Stoughton Alternative therefore, they are incorporated in the Stoughton Alternative summary.

1.6 APPLICANT'S PREFERRED ALTERNATIVE

Section 3.3.4 provides USACE's findings with respect to the Section 404(b)(1) Guidelines. The conclusions of this section are as follows:

- The Stoughton and Whittenton Alternatives (diesel and electric variants) all meet the basic project purpose and are practicable alternatives.

- The Stoughton Alternatives (the applicant's preferred alternatives) have slightly greater impacts on aquatic resources than the Whittenton Alternatives.

- Despite having less aquatic resource impacts, the Whittenton Alternatives have other significant adverse environmental consequences and is not less environmentally damaging than the Stoughton Alternatives. Specifically, the Whittenton Alternatives have greater impacts or less benefits than the Stoughton Alternatives in the following areas:

  - Regional emissions of air pollutants (due to lower ridership and VMT reduction)

  - Habitat of state-listed threatened, endangered, or special concern species

  - Biodiversity, habitat fragmentation, and ecological integrity

  - Noise and vibration impacts to environmental justice communities due to Attleboro Secondary through downtown Taunton.

  - At-grade crossings/public safety in Taunton

- Between the Stoughton Electric and Diesel Alternatives, the Stoughton Electric Alternative is environmentally preferable due to greater reductions in regional air pollutant emissions compared to the Stoughton Diesel Alternative and no contribution to local-level air pollutant hot-spots.

The U.S. Army Corps of Engineers has therefore determined that there is no practicable alternative to the Stoughton Electric Alternative which would have less adverse impact on the aquatic ecosystem, and also does not have other significant adverse environmental consequences.

1.7 NEXT STEPS IN THE DECISION MAKING PROCESS

The FEIS/FEIR will be distributed to all agencies, officials, and public libraries that received the DEIS/DEIR, as well as organizations and individuals that provided comments on the DEIS/DEIR. Agencies, officials, and the public will be invited to submit their comments on the FEIR following publication of the FEIR and submission to the Secretary of Environmental Affairs.

Following the review period, the Corps and the Massachusetts Secretary of Environmental Affairs will consider the information in the FEIS/FEIR and the comments received. The Corps will also consider the comments received as part of the process under Section 106 of the National Historic Preservation Act. The Corps will then issue a Record of Decision (ROD), which will complete the federal environmental review process, and continue with the permitting process.

The Secretary will issue a Certificate finding whether the FEIR adequately and properly complies with MEPA and 301 CMR 11.00. If the FEIR is found to be adequate, the Secretary may specify the conditions to be satisfied in a Section 61 Finding for the project. Following the receipt of the Certificate from the Secretary, the Massachusetts Department of Transportation will prepare and issue a final Section 61 Finding.[13] A draft Section 61 Finding is included in Chapter 7 of the FEIS/FEIR. Massachusetts General

[13] Massachusetts General Laws, Chapter 30, Section 61
https://malegislature.gov/Laws/GeneralLaws/PartI/TitleIII/Chapter30/Section61

Law Chapter 30, Section 61 authorizes state agencies with permitting responsibilities to make an official determination regarding potential impacts from a proposed project and whether impacts have been avoided, minimized, and/or mitigated for appropriately. The Law requires agencies/authorities to issue a determination that includes a finding describing the environmental impact, if any, of the project and whether all feasible measures have been taken to avoid or minimize said impact. The Section 61 Finding will incorporate the results of the consultations undertaken with the Corps, the Advisory Council on Historic Preservation, and the Massachusetts Historic Commission (MHC) under both Section 106 of the National Historic Preservation Act and the State Antiquities Act (Massachusetts General Laws, Chapter 9, Sections 26 et seq.). The issuing of this finding will end the Massachusetts environmental review process during planning. Additional reviews will be performed during the permit, design and construction phases.

Following these actions, and depending on the outcome of the decision making process, the project could proceed to the subsequent stages of project development. This will include final design, permitting, equipment procurement, construction, and preparation for system operations.

Table 1.5-1 Summary of Direct Impacts

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Description	Minor bus schedule enhancements	Electric or diesel commuter rail service to South Station using the Northeast Corridor, Stoughton Line, New Bedford Main Line, and Fall River Secondary. Ten new commuter rail stations would be constructed (North Easton, Easton Village, Raynham Park, Taunton, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction would occur at two existing commuter rail stations (Canton Center and Stoughton).		Variation of the Stoughton Alternative route using the abandoned Whittenton Branch right-of-way through the City of Taunton to avoid the Pine Swamp in Raynham. Ten new commuter rail stations would be constructed (North Easton, Easton Village, Raynham Park, Dana Street, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove and major reconstruction would occur at two existing commuter rail stations (Canton Center and Stoughton).	
Capital Cost (billions)	N/A	$1.82	$1.27	$1.82	$1.27
Operating and Maintenance Cost (millions)	N/A	$33.9	$33.8	$36.2	$36.1
Cost per rider[1]	N/A	$35.28	$29.71	$39.60	$33.32
Years to Construct	N/A	4.5	4	4.5	4
Transportation (Section 4.1)					
Reduction in Daily Regional Vehicle Miles Traveled (2035)	N/A	-255,932	-240,348	-201,232	-186,306
Travel Time- New Bedford to South Station (peak period), 2035	100	77	82	84	89
Daily Ridership (2035) at new stations[2]	N/A	4,570	4,430	4,040	3,930
Increase in Total Commuter Rail System Daily Ridership (2035)	N/A	10,300	9,750	9,400	8,950
Land Use and Zoning (Section 4.2)					
Total Acreage to be Acquired (private and public)	0	136.73	134.33	136.83	134.63

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Socioeconomics (Section 4.3)					
Residential Displacements	0	4	4	3	3
Business Displacements	0	6	6	6	6
Property Tax Revenue[3] Loss	0	$197,251	$197,251	$181,351	$181,351
Environmental Justice (Section 4.4)					
Noise Impacts in Environmental Justice Neighborhoods (number of residences impacted by moderate and severe increases in noise levels)	N/A	361		842	
Percent of Total Noise Impacts in Environmental Justice Neighborhoods	N/A	25%		30%	
Vibration Impacts in Environmental Justice Neighborhoods (impacted sensitive receptors)	N/A	86		105	
Percent of Total Vibration Impacts in Environmental Justice Neighborhoods	N/A	23%		25%	

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Visual Resources (Section 4.5)					
	Minimal impact.	Moderate overall impact on visual resources. Substantial impacts would occur in the out-of-service portion of the Stoughton line segment, from the Stoughton Station south to Weir Junction.	Moderate impact on visual resources overall, but less than Stoughton Electric because overhead electrical infrastructure would not be needed.	Moderate overall impact on visual resources. Substantial impacts would occur in the out-of-service portion of the Stoughton line and Whittenton Branch segments, from the Stoughton Station south to Raynham Junction and on to Whittenton Junction.	Moderate impact on visual resources overall, but less than Whittenton Electric because overhead electrical infrastructure would not be needed.
Noise (Section 4.6)					
Moderate Impacts Before Mitigation (# of Sensitive Receptors)	N/A	1,106	1,085	1,232	1,228
Severe Impacts Before Mitigation (# of Sensitive Receptors)	N/A	341	344	381	367
Vibration (Section 4.7)					
Impacted Residences (Without Mitigation)	0	369	369	417	417
Cultural Resources (Section 4.8)					
Direct Impacts to Historic Resources	0	5	5	5	5
Indirect Impacts to Historic Resources (Visual Impacts)	0	25	9	32	11

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Indirect Impacts to Historic Resources (Noise Impacts)	0	0	16	0	14
Indirect Impacts to Historic Resources (Visual and Noise Impacts)	0	35	19	33	19
Known Archaeological Sites	0	10	10	11	11
Air Quality (Section 4.9)					
Exceedance of National Ambient Air Quality Standards?	No	No	No	No	No
Regional Volatile Organic Compound Emissions (kg/day)	22,200	22,160	22,160	22,170	22,170
Regional Oxides of Nitrogen Emissions (kg/day)	19,256	19,159	19,210	19,169	19,227
Regional Particulate Matter 10 Emissions (kg/day)	3,240	3,240	3,241	3,240	3,241
Regional Particulate Matter 2.5 Emissions (kg/day)	1,490	1,490	1,491	1,490	1,491
Regional Carbon Monoxide Emissions (kg/day)	1,050,356	1,048,074	1,048,400	1,048,554	1,048,908
Regional Carbon Dioxide Emissions (Tons/Year)	24,717,339	24,656,479	24,688,173	24,667,849	24,703,175

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Open Space (Section 4.10)					
Land Acquisition from Protected Open Space (acres)	0	0.16	0.16	0.16	0.16
Farmland (Section 4.11)					
Impacts to Designated Farmland Soils (Acres)	0	18.6	16.0	18.8	16.2
Hazardous Materials (Section 4.12)					
Recognized Environmental Conditions (including layover facilities)[14]	0	39	39	42	42
Geology (Section 4.13)					
	No long-term adverse impacts	No long-term adverse impacts		No long-term adverse impacts	
Biodiversity (Section 4.14)					
Upland Habitat Loss (acres)	0	182.27	178.78	187.98	183.87
Wetland Habitat Loss (acres)	0	12.3	12.3	11.2	11.2
Vernal Pool Habitat Loss (acres)	0	1.43	1.43	0.8	0.8
Loss of Supporting Vernal Pool Upland Habitat (acres)	0	43.40	43.40	41.61	41.61

[14] Sites with the presence or likely presence of hazardous materials.

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Habitat Fragmentation	None	Increase in existing habitat fragmentation would result from reconstructing the Stoughton Line on the currently unused railbed, including in the Hockomock Swamp ACEC and the Pine Swamp.		Increase in existing habitat fragmentation would result from reconstructing the Stoughton Line and Whittenton Branch on currently unused railbeds, including in the Hockomock Swamp ACEC.	
Threatened and Endangered Species (Section 4.15)					
Impacted Species Habitat	None	Impacts to the habitat of eight state-listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, coastal swamp amphipod, mocha emerald dragonfly, Hessel's hairstreak, pale green pinion moth, and water-willow stem borer). Barrier effect on blue-spotted salamander, Blanding's turtle, and eastern box turtle considered moderate impacts.		Impacts to the habitat of eight state-listed species (blue spotted salamander, Blanding's turtle, eastern box turtle, coastal swamp amphipod, mocha emerald, Hessel's hairstreak, pale green pinion moth, and water-willow stem borer moth). Barrier effect on Blue-spotted salamander, Blanding's turtle, and eastern box turtle considered moderate impacts.	
Loss of migratory route habitat (barrier effect) (linear feet)	0	3.2 miles	3.2 miles	3.6 miles	3.6 miles
Wetland Resources (Section 4.16)					
Waterway Direct Permanent (acres)	0	1.9	1.9	1.8	1.8
Vegetated Wetland Direct Permanent Impacts (acres)	0	10.4	10.4	9.4	9.4
Total Federal Wetland Impacts (acres)	0	12.3	12.3	11.2	11.2
Wetlands Impacts within ACECs (acres)	0	0.2	0.2	0.2	0.2
Bank (lf)	0	16,813	16,813	16,581	16,581
Outstanding Resource Waters (acres)	0	1.5	1.5	1.1	1.1

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Bordering Land Subject to Flooding (acres)	0	6.7	6.7	5.0	5.0
Riverfront Area (acres)	0	7.9	7.9	7.8	7.8
Water Resources (Section 4.17)					
	None	Surface and groundwater resources would not be impaired due to the use of stormwater treatment practices.		Surface and groundwater resources would not be impaired due to the use of stormwater treatment practices.	
Coastal Zone (Section 4.18)					
Consistent with Massachusetts Coastal Zone Management Program Policies?	N/A	Yes	Yes	Yes	Yes
Number of Chapter 91 Regulated Resources Crossed[5]	0	36	36	31	31

1 Annualized capital cost and annual operating and maintenance cost estimates divided by annual passengers.
2 New daily round-trip transit trips at proposed South Coast Rail stations
3 Additional property tax revenue losses may result from small and/or partial acquisitions.
4 Sites with the presence or likely presence of hazardous materials
5 Massachusetts General Law Chapter 91 is implemented by Massachusetts Regulations at 310 CMR 9.00 (Waterways Regulations). The purpose of Chapter 91 and the Waterways Regulation is to protect certain public rights that are inherent in tidal waters of the Commonwealth and certain non-tidal rivers and streams. New construction, changes in use or substantial expansions of existing structures within these jurisdictional areas require approval under these regulations.

Table 1.5-2 Summary of Cumulative Impacts

	Resource					
	Land Use	**Wetlands**	**Biodiversity**	**Protected Open Space**	**Air Quality**	**Economy**
No-Build Alternative	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 928,031
	308,371 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	116,675 acres of decreased habitat quality in 2035	64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 75,212
		124,748 acres of wetlands remaining in 2035	307,813 acres of natural land remaining in 2035		28,691,855 tpy CO_2 emissions in 2035	Jobs: 417,864 Business Activity: $99B Tax Revenue: N/A
Stoughton Alternative Scenario 1	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	307,030 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	120,605 acres of decreased habitat quality in 2035	64,794 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,756 acres of wetlands remaining in 2035	303,883 acres of natural land remaining in 2035		27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B| Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)

	Resource					
	Land Use	Wetlands	Biodiversity	Protected Open Space	Air Quality	Economy
Whittenton Alternative Scenario 1	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	307,045 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	120,595 acres of decreased habitat quality in 2035	64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,754 acres of wetlands remaining in 2035	303,893 acres of natural land remaining in 2035		27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)
Stoughton Alternative Scenario 2	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	315,583 to 319,259 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	58,760 to 75,021 acres of decreased habitat quality in 2035	>64,794 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,759 to 124,760 acres of wetlands remaining in 2035	349,331 to 365,592 acres of natural land remaining in 2035		<27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)

	Resource					
	Land Use	Wetlands	Biodiversity	Protected Open Space	Air Quality	Economy
Whittenton Alternative Scenario 2	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	315,598 to 319,274 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	58,750 to 75,011 acres of decreased habitat quality in 2035	>64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,757 to 124,758 acres of wetlands remaining in 2035	349,477 to 365,738 acres of natural land remaining in 2035		<27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)

2 PROJECT PURPOSE AND NEED

2.1 INTRODUCTION

On May 8, 2008, the Massachusetts Executive Office of Transportation and Public Works (EOT) (currently known as MassDOT) submitted an application to the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and potentially Section 10 of the Rivers and Harbors Act of 1899 for a Department of the Army (DA) permit to discharge fill material into waters of the United States (U.S.), ranging in area from less than 11 acres to approximately 21 acres (depending on the alternative selected), including wetlands, incidental to the construction of new public passenger rail (or other public transportation) facilities connecting the terminal stations of Fall River and New Bedford with South Station in Boston, Massachusetts (the project).

The Massachusetts Department of Transportation (MassDOT) (formerly the Executive Office of Transportation and Public Works) considered several transportation facilities and corridor alternatives to implement this transit service over a distance of approximately 50 to 60 miles. Transportation modes considered during the environmental review process included commuter rail (diesel or electric) and rapid bus.

2.2 PROJECT PURPOSE AND NEED

2.2.1 Purpose of the Project

MassDOT's stated purpose is "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, MA, and to enhance regional mobility, while supporting smart growth planning and development strategies in the affected communities." As part of its review of the Department of the Army (DA) permit application, the Army Corps of Engineers (USACE, Corps) is required to evaluate the proposal with regard to the U.S. Environmental Protection Agency (EPA) *Guidelines for Specification of Disposal Sites for Dredged or Fill Material* ("EPA Guidelines") at Title 40 of the Code of Federal Regulations, part 230. The basic project purpose is examined by the U.S. Army Corps of Engineers to determine if the project is water-dependent. A project is water dependent if it requires access or proximity to, or siting within, a special aquatic site[1] in order to fulfill its basic purpose. The USACE has determined that the basic project purpose for the MassDOT proposal is: "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts." Since ground-based public transportation does not fundamentally require siting within a special aquatic site to meet this basic project purpose, the EPA Guidelines stipulate that practicable alternatives are (1) presumed to exist and (2) presumed to be less environmentally damaging than the proposed action, unless clearly demonstrated otherwise.

The overall project purpose is used by the USACE to evaluate whether there are less environmentally damaging practicable alternatives available. The 404(b)(1) Guidelines state that an alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of *overall* project purpose (40 CFR 230.10(a)(2)). This evaluation applies to all waters of the United States, not just special aquatic sites.

[1] 40 CFR Part 230 Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material Subpart E--Potential Impacts on Special Aquatic Sites.

Determination of the overall project purpose is the USACE's responsibility; however, MassDOT's needs and the type of project being proposed are considered by the USACE in reaching this determination. The overall project purpose is defined by the USACE as: "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, MA, and to enhance regional mobility. This definition is specific enough to define MassDOT's needs, but not so restrictive as to constrain the range of alternatives that must be considered under the EPA Guidelines.

For purposes of the current NEPA analysis, USACE considers and expresses the proposed project's underlying purpose and need from a public interest perspective when appropriate, but generally focuses on MassDOT's purpose and need statement. The Council on Environmental Quality (CEQ) regulations at 40 CFR 1502.13, stipulate that the EIS purpose and need statement "shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." The USACE exercises independent judgment in defining the purpose and need for the project from both MassDOT's and the public's perspectives. The purpose and need as independently determined by the USACE is: to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts, and to enhance regional mobility.

2.2.2 Need for the Project

2.2.2.1 Transportation Problems in the South Coast Region

The current transportation system connecting Southeastern Massachusetts (i.e. the South Coast region including the cities of Fall River and New Bedford and the area served by the Southeast Regional Planning and Economic Development District [SRPEDD]) with Boston and internally is primarily a highway system and characterized by a lack of transportation mode choice, especially public transit. The highway system is composed of major, limited access state routes, regional highways, and local roadways (Figure 1.2-1). As the population in the South Coast region and employment in the Boston area have grown, the demands on the roadway system linking Southeastern Massachusetts to Boston and the rest of the region have increased, as reflected by increased traffic volumes. The increase in traffic volumes has resulted in roadway congestion and travel delays, especially during peak hours that have become worse over the past decade. The increased volume of traffic and congestion have also adversely affected air quality (contributing to air quality conditions in the South Coast region that do not meet federal Clean Air Act standards) and traffic safety. Based on the Commonwealth's forecasts, regional growth and the trend of commuters to locate to areas further away from the Boston metropolitan core, such as the South Coast region will continue to increase the demand for transportation in the South Coast region.[2] This would exacerbate the current problems of congestion, delays, transportation safety and air quality and affect an increasing number of people. A more detailed discussion of the problems identified above, as well as other considerations, is provided in Sections 2.2.2.1 through 2.2.2.10 below.

2.2.2.2 Potential Solutions to the Problem

In consideration of the above, MassDOT has determined that improving the transportation system (facilities and services) in the South Coast region is necessary to address the transportation issues facing the region.

[2] CTPS January 28, 2011 Memo "South Coast Rail Work Trips to Boston," provided in Appendix 2.2-A.

Although important investments in regional transportation facilities and services are planned, these will primarily address localized congestion or safety concerns, or repair aging infrastructure. They would not fundamentally address the lack of regional mobility and service quality.

Expansion of transportation capacity in the South Coast region with the existing transit services (bus, taxis, park-and-ride and vanpool) is limited as they use the same roadway system and are thus subject to the same roadway congestion. Transportation system solutions based on highway improvements are limited due to policy considerations and constraints imposed by the physical conditions of the metropolitan Boston area, where such highway improvements would need to be implemented to be effective in addressing capacity and congestion issues.

However, while highway expansion and utilization of existing transportation services do not provide long-term solutions to the transportation problems, MassDOT has determined that enhancement of (currently inadequate) public transit connections (in terms of travel time, service frequency, capacity and geographic availability) *does* provide opportunities to improve transportation between New Bedford/Fall River and Boston and between South Coast cities (New Bedford, Fall River, Taunton). MassDOT therefore proposes enhancement of public transit connections (collectively known as the South Coast Rail project – see Figure 1.4-1) to improve transportation between New Bedford/Fall River and Boston and between South Coast cities. Various alternatives are under consideration to enhance public transit service (using different transit modes and corridors), and these are described in Chapter 3, *Alternatives*.

The proposed public transit enhancements are consistent with the transportation goals and objectives set forth in the regional transportation plans specifically created by the Metropolitan Planning Organizations (MPOs). The long-term transportation plans of the region support the development of transportation improvements that enhance accessibility, increase mobility, encourage alternatives to automobiles, and provide a more equitable distribution of transit services.

The following describes in greater detail the need for the project and aspects that relate to regional mobility and quality of service:

- Inadequate capacity of the existing transportation system to downtown Boston
- Congestion of the roadway system
- Lack of regional mobility
- Safety issues associated with the existing roadway system
- Air quality issues associated with the existing transportation system
- Demand for transportation services
- Inadequate public transit services
- Absence of other regional transportation improvements to address the identified transportation needs
- State and local public policy context

- Smart Growth considerations

A discussion of each of the above problems is provided below. A more detailed discussion of existing and future deficiencies of the transportation system (including key factors listed above), especially as it relates to existing and future transportation demand, is provided in Chapter 4.1, *Transportation*.

Inadequate Existing and Future Capacity of the Transportation System from the South Coast Region to Downtown Boston

The existing transportation system serving the South Coast region has inadequate capacity, leading to lack of regional mobility, between the South Coast region and Downtown Boston and within the South Coast region itself. This is due in part to the relative dearth of public transit connections between New Bedford/Fall River and Boston and between South Coast cities (New Bedford, Fall River, Taunton and others). An overview of the existing transportation system deficiencies is provided below. A more detailed discussion is provided in Chapter 4.1, *Transportation*.

Roadway System Capacity and Regional Growth

The South Coast region is served by a network of roadways varying from limited access facilities to local roads. The primary highway facilities link the major urban areas of New Bedford, Fall River, and Taunton with each other and to the metropolitan Boston region. Highways provide the primary access routes within the South Coast region and to adjacent regions. The main highway facilities in the South Coast region are Route 24, Route 140, I-195, and I-495 (Figure 1.2-1). Together, Routes 24 and 140 link New Bedford and Fall River to the metropolitan Boston region. The two interstate routes (I-95 and I-495) serving the South Coast region are not part of the primary highway access system to the metropolitan Boston region. Interstate I-195 provides east-west access across the region, connecting Cape Cod, Wareham, New Bedford, Fall River, and Providence, while I-95 just west of the region connects Providence with greater Boston. I-495 runs northwest-southeast, connecting Cape Cod, Wareham, and Taunton. The only option for traffic generated within the South Coast region to reach downtown Boston are I-93/Route 128 and I-93/Route 3 (Southeast Expressway). Route 128 is Boston's inner circumferential highway which provides access to much of the metropolitan Boston region. Following I-93 north/Route 128 south from Route 24 leads to I-93/Route 3 (Southeast Expressway) and downtown Boston, approximately 8 miles from the I-93/Route 128/Route 3 interchange in Braintree. Following I-93 south/Route 128 north from Route 24 leads to I-95 approximately 3 miles to the north and to I-90 approximately 15 miles to the north. The Massachusetts Turnpike (I-90) provides the only limited-access highway to Boston from west of the city.

Both Route 128 and the Southeast Expressway are heavily congested roadways, particularly during peak periods. Traffic volumes on Route 128 are approximately 135,000 vehicles per day north of Route 24 (towards I-95) and 167,000 vehicles per day to the south (towards I-93/Route 3). Traffic volumes on I-93/Route 3 are as high as approximately 191,000 vehicles per day. On Route 24, the major north south corridor in the South Coast region, the average daily traffic ranges from 26,700 vehicles per day in Fall River to over 115,000 vehicles per day in Randolph. Traffic congestion and long delays are common on the northern segments of this highway during weekday peak commuting periods.

As the population in the South Coast region and employment in the Boston area have grown, the demands on the roadway system linking Southeastern Massachusetts to the rest of the region have increased. Traffic volumes on the limited-access state routes linking the South Coast region to the employment centers of Boston have been growing over the past decade, as shown in Chapter 4.1,

Transportation, Table 4.1-9: Average Daily Traffic Volume Growth. Overall, traffic volumes on the roadways in the South Coast region have grown at an annual rate of two to three percent over the past decade. However, traffic volumes have grown even more rapidly in some areas. The largest increases in traffic volumes have been on Route 24 in Raynham and Taunton, where the traffic volumes have had annual increases of 4.1 and 5.0 percent respectively. Traffic volumes on Route 140 in Taunton have been increasing at an annual rate of 2.2 percent. Route 128 and I-93 (the Southeast Expressway) exhibit relatively stable traffic volumes, reflecting the fact that they are already some of the most congested highways in the state and traffic volumes on these roadways are at or near capacity for long portions of the day, and have limited capacity for further increases in average daily traffic volumes leading to further congestion with continued population growth. The minor decrease in traffic on portions of I-93 may reflect changes in motorist route choices due to Central Artery/Tunnel project construction, and demand reductions from the Route 3 corridor due to the restoration of the Old Colony Commuter Rail service.

2.2.2.3 Congestion of the Roadway System

The increases in traffic volumes on the principal highways linking the South Coast region to downtown Boston have led to deteriorating level of service (LOS) on these roadways, especially during peak periods. Delays on these roadways are now common and have become worse over the past decade. These delays are especially prevalent on Route 24 as it approaches Route 128/I-93 in Randolph. Increases to peak-hour volumes of up to 3,500 and 4,000 vehicles per hour on Route 24 and on I-93/Route 128 in Braintree and in Randolph, respectively, have led to deterioration of LOS down to F on these major roadways, which are intended to relieve the local roadways from regional traffic. Several mitigation measures have been implemented on I-93 to reduce congestion (HOV lanes, improved MBTA Red Line service, and Old Colony Commuter Rail service). However, this highway continues to operate at poor levels of service, resulting in substantial congestion and decreased safety. There are no roadway alternatives to the use of Route 24 and I-93, and no mitigation measures are planned to reduce congestion.

The lack of adequate capacity of the roadway system and the resultant reduction in LOS is anticipated to become even more problematic with the increased demand for transportation resulting from the growth of the South Coast region, especially as commuters living near Boston are moving away to areas further from the metropolitan core. Southeastern Massachusetts has been one of the fastest growing areas in the Commonwealth. Between 1960 and 2000, this area experienced a growth rate of 31 percent. Between 1960 and 1990, this area had an annual growth of over 2,500 people per year from a base population of 343,353 to its 1990 population of 430,846. Growth slowed somewhat between 1990 and 2000, to an annual growth of approximately 1,950 people per year. These figures translate to a growth of 4.5 percent between 1990 and 2000. Each 10,000 new residents coming into the area are expected to generate a need for 3,500 new residential units, and are predicted to generate 27,650 new vehicle trips per day, further degrading the LOS provided by the regional transportation system. As described in greater detail in Chapter 4.1, *Transportation*, the level-of-service of the roadway system connecting the South Coast region to Boston will deteriorate even further, resulting in a concomitant increase in congestion, accidents, travel time and air pollution; not only on the highways themselves but potentially also on nearby local roadways that may absorb the traffic spillover from nearby congested highways.

2.2.2.4 Lack of Regional Mobility

The lack of regional mobility is reflected by poor connectivity between the South Coast Area and Boston. While GATRA and the Southeastern Regional Transportation Authority (SRTA) do provide intraregional transit service, there are only a limited number of one-seat transit rides from one municipality to another within the South Coast region and adjoining regions, as discussed in greater detail in Section 2.2.2.7. In this regard the South Coast region is severely underserved relative to other comparable regions, especially those that have a commuter rail system.

Of all regions in the Commonwealth, the South Coast region by this measure has the lowest regional mobility index. This is partially due to the absence of commuter rail, which in other regions provides intra (within) regional connectivity (mobility), partially as a byproduct of interregional connectivity with Boston. Chapter 4.1, *Transportation* provides a discussion of interregional links and regional mobility (Table 4.1-47).

In contrast with commuter rail services in other regions that have multiple stops along transit lines, existing express bus services within the South Coast region are by necessity limited to a few stops in order to realize a total travel time competitive with commuting by automobile. Serving additional communities with the bus services would substantially slow service to unacceptable levels, which would result in fewer transit riders. The second constraint that limits intraregional connections is bus capacity. In order to attract riders, existing bus services seek to minimize headway (maximize frequency) while operating at or near capacity almost from their initial point of departure, with very limited or no intermediate stops within the South Coast region. Existing bus services thus operate as exclusive routes with few in-between stops and thus do not provide substantial interregional connectivity.

2.2.2.5 Safety Issues Associated with the Existing Roadway System

The number of accidents on the primary travel routes within the South Coast region has generally been increasing over the past years, as described in detail in Chapter 4.1, *Transportation*, and in the accident tables included with Appendix 4.1-B. Projected future growth in traffic volume on the principal South Coast region roadways cannot be sustained by the current regional transportation system. Recurrent traffic congestion is becoming a more significant problem for the region, as is the increasing frequency of traffic accidents, especially along congested roadway corridors. Traffic volume increases may thus contribute to increased risk of injury and property damage for the commuting public.

2.2.2.6 Air Quality Issues Associated with the Existing Transportation System

Motor vehicles are the predominant sources of ozone precursor emissions within the South Coast region, which has been classified as a Severe Non-Attainment Area for ozone, which means that the region does not meet one or more of the National Ambient Air Quality Standards for the ozone, one of the criteria pollutants designated in the Clean Air Act. Automobiles also emit carbon monoxide through the partial combustion of carbon-containing compounds in gasoline. Reducing greenhouse gas emissions is a priority for the Commonwealth and the United States. Federal and State agencies such as EPA, USDOT, the Massachusetts Executive Office of Energy and Environmental Affairs and MassDOT[3] are

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[3] http://www.epa.gov/dced/partnership/index.html#livabilityprinciples; http://www.epa.gov/otaq/climate/publications.htm#otherapproaches' http://www.epa.gov/dced/; http://www.epa.gov/climatechange/wycd/road.html; "Transportation's Role in Reducing U.S. Greenhouse Gas Emissions", Volume 1, Synthesis Report, Report to Congress, USDOT, April 2010. (http://ntl.bts.gov/lib/32000/32700/32779/DOT_Climate_Change_Report_-_April_2010_-_Volume_1_and_2.pdf); http://www.eot.state.ma.us/downloads/90_DayReport/GreenDOT_070710.pdf; http://www.massdot.state.ma.us/main/Documents/HealthyTransportationCompact/P-10-002.pdf; http://www.mass.gov/Eoeea/docs/eea/energy/2020-clean-energy-plan.pdf.

working to reduce greenhouse gas emissions from motor vehicles and fuels through several initiatives, including efforts to promote public transit, multi-modal systems and transit-oriented development. As discussed previously, and described in greater detail in Chapter 4.1, *Transportation* and Chapter 4.9, *Air Quality*, the highways serving the South Coast region convey high volumes of automobile traffic, and have high levels of congestion (both of which increases vehicle emissions). Transportation alternatives for South Coast commuters that would reduce the mobile-source emissions of greenhouse gases are limited due to the inadequacy of the transit system. A shift in travel from automobiles to public transit could reduce vehicle emissions and improve regional air quality.

Vehicle Miles Traveled (VMT) measures the extent of motor vehicle operation or the total number of vehicle miles travelled within the study area on given day. It is an important gauge for air quality and Greenhouse Gas emissions, as emissions of air pollutants and greenhouse gases is related to the distance traveled by automobiles (and to a lesser degree congestion). Regions with high VMTs per capita have a greater potential for poor air quality and GHG emissions compared to regions with lower VMT per capita. One of the reasons for the relatively high VMT in the South Coast region is the much greater proportion of transportation by car versus rail or bus, as compared to other regions. Daily regional automobile VMT is expected to grow from 109,926,000 under existing conditions to 118,894,000 by 2035 under the No-Build Alternative (based on updated modeling conducted by CTPS in 2012, see Appendix 3.2-I).

2.2.2.7 Demand for Transportation Services

Southeastern Massachusetts experienced a 4.5 percent population growth between 1990 and 2000. Growth slowed between 2000 and 2010, with an overall population increase in the South Coast Region of 2.9 percent. Factors driving growth in the region include the desire for affordable housing outside the Boston metropolitan area. Many of the people relocating to the area are retaining their jobs in the Boston market and thus increase the demand for transportation services between the area and Boston, as well as within the South Coast region. The number of commuter trips between the South Coast region and Boston was 8,000 in 2000 and is expected to increase by 1,200 to 9,200 in 2030.[4] Most of the commuter trips from the region to the Boston market are in single occupant vehicles and public transit accounts for a minor proportion of work trips in the service area. MassDOT expects this trend to continue in absence of improved public transit connections between Boston and the South Coast region.

2.2.2.8 Inadequate Public Transit Services

The inadequacy of public transit service in the South Coast region is reflected in several aspects: The *availability* of public transit service in absolute terms and compared to other regions, especially those that have a large commutation segment to downtown Boston, and the *quality* of transit service as expressed in travel time and frequency of service, especially during the peak hours. The geographic availability of transit service to people in the region is also relevant in terms of access to employment opportunities and services, including education and healthcare. In addition to transit services between the South Coast region and Boston, transit services within the South Coast region are also relevant. An indicator of quality of transit service is the MBTA's *Service Delivery Policy.* This policy identifies minimum frequency of service levels that provides the guidelines by which the MBTA maintains accessibility to the transportation network within a reasonable waiting period. The minimum frequency of service standards is the minimum frequency that must be maintained in a service. For Commuter Rail and

[4] CTPS January 28, 2011 Memo "South Coast Rail Work Trips to Boston", provided in Appendix 2.2-A.

Commuter Bus minimum frequencies should provide three trips in a peak direction during the AM and PM peak periods.

Existing transportation in the South Coast region is predominantly auto-oriented and transit services within the South Coast region are limited to bus and demand-response services operated by regional transit authorities and private carriers (Figure 2.2-1). Most of the commuter trips from the South Coast region to the Boston market are in single occupant vehicles and public transit accounts for a minor proportion of work trips in the service area. To a large extent, this can be attributed to the lack of public transit alternatives other than privately-operated bus service. As discussed below, many communities in the South Coast region lack public transit facilities other than private bus services and major population centers are as much as 25 miles from existing commuter rail stations. All commuter rail stations are located outside the South Coast region and are already nearing capacity.

Bus Service

Local bus public transit within the South Coast region is provided in Taunton by GATRA and in New Bedford and Fall River by SRTA. GATRA also operates intercity bus service between Taunton and Providence, Rhode Island.

Bus service to Boston from the South Coast region including the cities of Taunton, Fall River and New Bedford is limited to private carriers. Private carriers also connect Fall River, New Bedford, and Taunton with each other and with Providence, Newport, and points beyond. Bus service from the South Coast region to Boston uses the regional roadway system and is thus subject to the same congestion and safety problems on the highway system as other vehicles, resulting in long and unpredictable travel times. The bus service is also substantially more expensive than MBTA commuter rail services over similar distances, creating an additional constraint on usage of bus service, especially for lower income travelers. Some bus service exists to commuter rail stations outside the South Coast Area; however the transfer between two transit services increases overall travel time, rendering it less attractive. The private express bus service is subject to the same congestion.

While the current bus service plays an important role, especially as it is the only regular transit service between the South Coast region and Boston, its use is limited, reflecting constraints related to travel time, service frequency and cost. A summary of bus service between the South Coast Area and Boston is presented below. A more detailed description of bus service is provided in Chapter 4.1, *Transportation*.

Vanpools/Carpools

Vanpools in communities of the South Coast region are provided through MassRides, a program of MassDOT. Although relevant as a complementary service vanpool and carpool travel times are severely impacted by slow travel speeds on the expressway and secondary roads.

Park-and-Ride

Park-and-ride facilities and carpool/vanpool services are offered along the primary regional travel corridors in the South Coast region. Park-and Ride lots are associated with car-pooling, van-pooling or private bus service to Boston. There are nine public park-and-ride lots located in the South Coast region, of which five are located along the primary roadways from the region to the Boston metropolitan area and four not in the immediate vicinity of the primary access routes to Boston. In addition, three private park-and-ride lots in the South Coast region are available exclusively for customers using the private bus services to Boston. Three public park-and-ride lots are outside the South Coast region, but still along the

Route 24 access corridor to Boston. An overview of Park-and-Ride Facilities is presented in Chapter 4.1, *Transportation*. Park-and-ride facilities as feeders for bus and car-pooling and van-pooling services are limited in their effectiveness as a transportation connection with Boston, due to the inconvenience of transfers and travel times associated with the congested roadway system, both in terms of traveling to the Park-and-ride facility and travel from the Park-and-Ride facility to Boston.

Commuter Rail

Many communities within the South Coast region do not currently have commuter rail service. The nearest commuter lines (MBTA's Providence Line and Middleborough Lines) terminate on the northwest and northeast edges of the South Coast region. Starting in May 2013, MBTA, in cooperation with the Cape Cod Regional Transit Authority, established a seasonal weekends-only service known as the Cape Flyer, extending the Middleborough line from its current terminus in Middleborough to Hyannis. However, this service is limited to three round-trips per week, all on weekends, and thus serves weekend tourists rather than daily commuters between Boston and the South Coast. In fact, the three major cities in the South Coast region: Taunton, Fall River, and New Bedford are the only cities within 50 miles of Boston that are not served by passenger rail. The closest commuter rail stations to the South Coast region are Middleborough/Lakeville (MBTA Middleborough Line), and Attleboro Station and Providence Station (MBTA Providence Line). The Middleborough Line serves areas east of the South Coast region and southeast of Boston, with stations in Lakeville and Bridgewater, while the Attleboro/Providence and Stoughton lines serve communities to the north and west of the South Coast region. The Attleboro and Mansfield stations are the primary access points on the Attleboro/ Providence Line. The Stoughton Station serves as the primary access point on the Stoughton Line. All communities in the heart of the South Coast region are outside a 6-mile access radius of these stations, and some—including major population centers such as New Bedford and Fall River (combined population of 182,000)—are more than 20 miles and up to 25 miles from the nearest train station (Table 2-1).

Table 2-1 Proximity of South Coast Communities to Commuter Rail Service

Community	Closest Station	Proximity[1] (miles)
Acushnet	Middleborough/Lakeville	15.7
Berkley	Middleborough/Lakeville	10.7
Dartmouth	Middleborough/Lakeville	20.9
Dighton	Middleborough/Lakeville	13.7
Easton	Stoughton	5.1
Fairhaven	Middleborough/Lakeville	22.5
Fall River	Middleborough/Lakeville	19.6
Freetown	Middleborough/Lakeville	10.8
Lakeville	Middleborough/Lakeville	3.3
Mattapoisett	Middleborough/Lakeville	19.4
New Bedford	Middleborough/Lakeville	20.8
Norton	Mansfield	5.7
Raynham	Bridgewater	7.5
Rehoboth	Attleboro	8.8
Rochester	Middleborough/Lakeville	13.7
Somerset	Providence	19.4
Swansea	Providence	15.5
Taunton	Middleborough/Lakeville	9.7

Westport	Middleborough/Lakeville	28.3

1 Proximity measured to population centroid
Source: Google Maps

Due to their distance to the nearest commuter rail station the existing commuter rail lines to Boston are difficult for residents to access, especially for those living in Taunton, Berkley, Freetown, Fall River, and New Bedford. Travel to these stations is also limited to local secondary roads, which further increases travel time.

For those commuters in the South Coast region who live closer to commuter rail stations outside the South Coast region, constraints to the usage of the existing stations are posed by station parking and system capacity issues. Commuter rail services are currently approaching capacity and system capacity is limited due to the lack of adequate parking at these stations. Commuter rail parking lots in Attleboro, Mansfield, Stoughton, and on the Middleborough Line are already heavily utilized , as described in Chapter 4.1, *Transportation*, and are either unable or will not be able to handle any more growth. In addition, some peak hour trains experience heavy passenger loads, which was especially evident before the 2009 economic downturn. Therefore, the existing commuter rail service, although within reach of some communities in the South Coast region, is not sufficient to handle the anticipated growth in ridership. A detailed discussion of ridership forecasts is provided in Chapter 4.1, *Transportation*. Growth projections are presented in Chapter 4.3, *Socioeconomics.*

Poor or limited transportation opportunities also constrain access by South Coast region residents to important Boston destinations, including education opportunities provided by numerous private and public colleges and universities, the highest concentration of medical facilities and specialties in the Commonwealth, cultural facilities, and sporting events. Existing highway congestion, extended travel times, and limited (and often expensive) parking affect the ability of many area residents to access these destinations.

The City of Boston continues to provide substantial employment opportunities at all levels, and also contains a substantial employment labor force. Many of the South Coast region communities, particularly in the towns of Easton, Raynham and Taunton, have a substantial work orientation to Boston. Access between South Coast region communities and downtown Boston is constrained by the limited, overloaded highway system and the lack of alternative transit modes. The ability to park in Boston is constrained by the limited space available to provide parking, high demand for parking resulting from new development, the high cost of parking, and the metropolitan area parking freeze. Residents of South Coast region communities would benefit substantially from improved employment access and reduced cost of commuting and parking.

In sum, commuter rail service currently does not extend into the South Coast region, making access to commuter rail difficult for area residents.

2.2.2.9 Absence of Other Regional Transportation Improvements to Address the Identified Transportation Needs

Local communities, regional planning agencies, and MassDOT are pursuing a number of transportation and development projects within the study area. They are included in the long-range transportation plans and Transportation Improvement Programs of the Boston Metropolitan Area Planning Council (MAPC), Old Colony Planning Council (OCPC), and the SRPEDD. While important to the transportation system of the South Coast region, MassDOT has indicated that these programmed projects will not meet

the transportation needs of the region, as it relates to the inadequate capacity of the existing transportation system to Downtown Boston.

2.2.2.10 State, Regional and Local Public Policy Context

The South Coast Rail project is proposed by MassDOT as part of a comprehensive effort to achieve a series of broad study area transportation and development goals, as well as specific objectives for improving the quality of transportation services and the equity of the distribution of services within the South Coast region. These goals and objectives have been developed by MassDOT over several decades as part of both broad-based policies and specific regional documents and include the following statewide plans and reports:

GreenDOT Policy Directive (2010)—MassDOT will promote sustainable economic development, protect the natural environment, and enhance the quality of life for all the Commonwealth's residents and visitors by reducing greenhouse gas emissions, promoting the healthy transportation options of walking, biking and public transit and supporting smart growth development.

South Coast Rail Plan for Action (2007)—This report identified the South Coast of Massachusetts as one of the fastest growing regions in the state, and stated that restoration of passenger rail service could be a catalyst for economic development and job growth in the region. The plan also stated that the project would reach under-served populations and promote smart growth.

MBTA Program for Mass Transportation (2003, 2010 Draft Update[5])—This state program identifies mass transit needs through the year 2030 that would require capital expenditures and includes commuter rail service to New Bedford and Fall River.

Toward a New Growth Policy for Massachusetts (1977)—This report encouraged redevelopment of older urban areas across the state. Both New Bedford and Fall River are older urban areas seeking economic development opportunities. The two cities are designated as both federal and state economic target zones. Second, the Southeastern Massachusetts area provides affordable housing opportunities for professionals working in the metropolitan Boston area.

Boston Transportation Planning Review (1970-1973)—This program re-examined the highway construction program in the Boston area and established a new transportation strategy with a strong emphasis on transit as a means to provide additional transportation capacity into Boston.

In addition to statewide plans, regional transportation goals provide a basis for evaluating options for improvement of transportation services and facilities in the South Coast region. They support improvements to transportation services, increase mobility, provide transit services that are cost-effective, and provide a more equitable distribution of transportation benefits. Their objectives are consistent with those of the proposed project and their locally adopted goals and objectives support the broad, long-term study area development and transportation strategy, as described below.

New Bedford/Fall River/Taunton Region—The SRPEDD has adopted a multi-level set of transportation goals and objectives in the region's 2007 Regional Transportation Plan. This planning document includes goals and objectives in support of the region's overall goal of developing and maintaining an effective, safe, and accessible transportation system that promotes sustainable economic development and

[5] http://www.ctps.org/bostonmpo/4_resources/1_reports/1_studies/3_transit/pmt.html.

preserves the region's quality of life. The plan specifically states that continued support for extending commuter rail service to Taunton, Fall River, and New Bedford helps achieve these goals.

Brockton Region—The OCPC has adopted a multi-level set of transportation goals and objectives in the region's 2007 Regional Transportation Plan. This planning document includes 14 goals and objectives in support of community vision, including smart growth principles and a transportation system that is regionally coordinated and based on effective transportation and land use planning.

Boston Region—The MAPC adopted eight visions and corresponding policies in their 2007 Regional Transportation Plan. These goals and policies are based on a vision for the region that emphasizes the maintenance, management, and operation of a multimodal transportation system that provides a high degree of mobility for all people and supports the reduction of air quality degradation and other environmental degradations caused by transportation.

2.2.2.11 Smart Growth Considerations

Smart Growth as proposed by MassDOT integrates two needs identified by the South Coast region that are related to transportation: economic development and environmental preservation.

Southeastern Massachusetts has been the fastest growing region in the Commonwealth for many years both in terms of population and housing units. At the same time, population and housing growth has been unevenly distributed, with the historic cities of Fall River and New Bedford experiencing a decline in population and economic vitality while exurban areas have been experiencing development sprawl resulting in the loss of farms, fields and forests and damages to the character of the historic villages and cities within the region. There is a need for smart growth planning within the region to address the adverse effects of sprawl resulting from current and projected further uncontrolled growth and loss of open space.

The poor connectivity to the metropolitan Boston area may constrain economic activity in the urban areas of New Bedford and Fall River, which in 2006 had substantially higher unemployment rates (8.2 to 8.6 percent) than the state average (5 percent) at that time. The 2009 economic crisis further exacerbated this trend with unemployment rising to 12.4 to 12.6 percent by August 2009 in New Bedford and Fall River, respectively, compared to a statewide average of 9.1 percent. According to MassDOT, improved access to employment markets in Boston could provide employment opportunities for the New Bedford and Fall River labor force that could provide economic benefits for these communities. Commuter rail service could also allow limited "reverse commutes" from area communities like Taunton to New Bedford and Fall River, which would thereby gain access to a larger labor pool within the Southeastern Massachusetts region.

MassDOT's intent is for the South Coast Rail project to provide opportunity to generate new economic development and to shape this growth so that the project helps preserve environmental resources. The project is proposed to be implemented by MassDOT in partnership with municipalities. The transportation project would be planned by MassDOT in conjunction with local land use planning to help cluster people and jobs near transit facilities. The intent of the transportation project proposed by MassDOT would be to help open up new economic development opportunities, while directing growth away from natural areas and reducing sprawl. A discussion of future growth is provided in Chapter 4.2, *Land Use and Zoning*, and Chapter 4.3, *Socioeconomics*. A discussion of Smart Growth as proposed by MassDOT is provided in Chapter 5, *Indirect Effects and Cumulative Impacts*, which describes how

MassDOT through its Smart Growth policies seeks to reduce indirect effects and cumulative impacts on the environment.

2.3 PURPOSE AND SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT

This document has been prepared to comply with the requirements of NEPA, the CEQ regulations for implementing NEPA, [Title 40 CFR Parts 1500-1508], and the USACE Regulatory Program NEPA implementing regulations at Appendix B to 33 CFR Part 325. On May 7, 2008, the USACE determined that an EIS is required for this proposed project because of the project's potential to significantly affect the quality of the human and natural environment. The purpose of this EIS is to assess the environmental impacts associated with the construction and operation of transit enhancements between Fall River / New Bedford and Boston proposed by EOT.

Pursuant to its responsibilities under Sections 10 and 404, the USACE, therefore, has a responsibility to review permit requests seeking authorization to (1) perform work or build structures in the navigable waters of the United States and/or (2) discharge dredged or fill material into all waters of the United States. The USACE review considers MassDOT's purpose and need from a public interest perspective. The public interest determination involves more than an evaluation of impacts to the aquatic environment. Once the project has been determined to comply with the EPA Guidelines, the project must also be evaluated to ensure that it is not contrary to the public interest. There are 20 public interest factors listed in 33 CFR 320.4(a) (1). A project may have an adverse effect, a beneficial effect, a negligible effect, or no effect on any or all of these factors. The district must evaluate the project in light of these factors, other relevant public interest factors, and the interests of MassDOT to determine the overall balance of the project with respect to the public interest. The EIS provides the basis for this public interest review, as outlined in Title 33 CFR Part 320.4, which states:

> The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest. Evaluation of the probable impact which the proposed activity may have on the public interest requires a careful weighing of all those factors which become relevant in each particular case. The benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. The decision whether to authorize a proposal, and if so, the conditions under which it will be allowed to occur, are therefore determined by the outcome of this general balancing process. That decision should reflect the national concern for both protection and utilization of important resources. All factors which may be relevant to the proposal must be considered including the cumulative effects thereof: among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people.

The public interest review is thus a balancing test by the USACE of the foreseeable benefits and detriments of proposed projects on an individual and cumulative basis. The following general criteria of the public interest review must be considered in the evaluation of every permit application (see 33 CFR 320.4(a) (2)):

(i) The relative extent of the public and private need for the proposed structure or work

(ii) Where there are unresolved conflicts as to resource use, the practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed structure or work; and
(iii) The extent and permanence of the beneficial and/or detrimental effect(s) that the proposed structure or work is likely to have on the public and private uses to which the area is suited.

The USACE is neither a proponent nor opponent of any permit proposal. The decision to issue or deny a permit is based, in part on the weighing and balancing of the public interest factors. In order to issue a permit, the District Engineer must determine that it would not be contrary to the public interest (33 CFR 320.4(a)). Further, the EPA Guidelines prohibit the issuance of a permit if the discharge is not the least environmentally damaging practicable alternative, or would cause or contribute to significant degradation of waters of the United States (40 CFR 230.10(a)(4).

2.3.1 Environmental Impact Report

The proposed project is subject to review by the Commonwealth of Massachusetts under the Massachusetts Environmental Policy Act (MEPA) because it is being undertaken by a state agency and because it meets or exceeds the review thresholds set forth in the MEPA regulations, including thresholds for a mandatory EIR. The MEPA imposes a requirement on project proponents to understand and fully disclose the potential impacts of a project, both positive and negative; to study feasible alternatives to a project; and to avoid, reduce, or mitigate environmental impacts to the maximum extent feasible. In order to streamline the environmental review process and to facilitate public involvement, MEPA and the USACE are coordinating review of a joint EIS/EIR with the intent to provide the information and analysis required for both federal and state review.

The project is undergoing environmental review pursuant to the following sections of the MEPA regulations at 301 CMR 11.00, which establish the standards for environmental impact review and a basic procedural outline for conducting that review: Section 11.03(a)(1)(5) because it involves construction of a new rail or rapid transit line along a new, unused or abandoned right-of-way; Section 11.03(3)(a)(l)(a) because it will result in alteration of more than one acre of bordering vegetated wetlands (BVW); Section 1 1.02(a)(2) because it involves alteration requiring a variance in accordance with the Wetlands Protection act; Section 11.03(l)(a)(l) and (2) because it may result in alteration of 50 or more acres of land and creation of 10 or more acres of new impervious area; Section 11.03(1 l)(b) because it is located within a designated Area of Critical Environmental Concern (ACEC); Section 1 1.03(b)(3) because it involves conversion of land held for natural resource purposes in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth; Section 11.03(2)(b)(2) because it would result in more than 2 acres of disturbance of designated priority habitat that results in a take of a state-listed species; and Section 1 1.03(10)(b)(l) because it may result in demolition of a part of a state-listed historic structure. The project may also meet or exceed other MEPA review thresholds depending upon its final design. Because the proposed project is being undertaken by a state agency MEPA jurisdiction is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in the MEPA regulations.

Additional state approvals, reviews and permits required for the project include a Water Quality Certification pursuant to Section 401 of the Clean Water Act, a Chapter 91 License and a Variance from the Wetlands Protection Act (WPA) from the Massachusetts Department of Environmental Protection (MassDEP). The project also requires local Orders of Conditions under the WPA (and, on appeal only, Superseding Order(s) from MassDEP). Other permits or approvals required for the project include a Conservation and Management Permit from the Natural Heritage and Endangered Species Program

(NHESP). The project is subject to review by the Massachusetts Historical Commission and the Office of Coastal Zone Management. The project is also subject to the MEPA Greenhouse Gas Emissions Policy and Protocol.

3 ALTERNATIVES

3.1 DEVELOPMENT OF ALTERNATIVES

3.1.1 Introduction

The restoration of passenger rail service to the South Coast region has been extensively studied for almost 20 years. Prior to 1958, the Middleborough, Stoughton and Attleboro rail lines were part of the New York, New Haven and Hartford Railroad system that provided service to Fall River and New Bedford from Boston's South Station, via Canton Junction, along the Stoughton Branch railroad (which included the Whittenton Branch in Raynham and Taunton, running around the northwest edge of the core of the City of Taunton and connecting the Stoughton Line with the Attleboro Secondary). Since discontinuation of this service, commuter rail has only been available to southeastern Massachusetts along the Boston-Providence Northeast Corridor, with stops in Attleboro and South Attleboro, and the Old Colony Middleborough Line, which terminates in Lakeville. Starting in May 2013, MBTA, in cooperation with the Cape Cod Regional Transit Authority, established a seasonal weekends-only service known as the Cape Flyer, extending the Middleborough line from its current terminus in Lakeville, to Hyannis. However, this service is limited to three round-trips per week, all on weekends, and thus serves weekend tourists rather than daily commuters between Boston and the South Coast. Thus, none of these services provide an opportunity for commuters from the Fall River or New Bedford areas to easily or efficiently access rail transportation to Boston.

In 2000, the MBTA completed a Draft EIR that analyzed six alternative routes for providing improved transportation between downtown Boston and the cities of Fall River and New Bedford. The Draft EIR focused on the following alternatives: (1) extending the existing MBTA Stoughton Line, (2) extending the existing MBTA Middleborough Line and (3) providing new service, branching off from the Providence Line near Attleboro. In 2002, a Final EIR was prepared by the MBTA and on August 30, 2002, the Secretary of Environmental Affairs issued a Final Certificate (Executive Office of Environmental Affairs [EEA] File # 10509).

Section 404 of the Clean Water Act Requires a Department of the Army permit for the discharge of dredged or fill material into waters of the United States, including adjacent wetlands. The Department of the Army permit program is administered by the U.S. Army Corps of Engineers (Corps). Since the South Coast Rail Build Alternatives would result in the discharge of fill material into greater than 1 acre of waters of the United States, including wetlands, a Department of the Army Individual Standard Permit is required.[1]

Because the project would require a Clean Water Act permit from the Corps in order to proceed with construction, federal environmental review is required under NEPA. Previous environmental review studies did not take into consideration federal requirements. The Massachusetts Executive Office of Energy and Environmental Affairs also requires review, pursuant to the Massachusetts Environmental Policy Act, due to the lapse of time. To minimize duplication of effort, the Corps and MEPA office agreed that the concurrent NEPA and MEPA reviews should proceed through a combined state and federal environmental review document, in accordance with CEQ regulations at 40 CFR 1506.2. MassDOT (then, the Executive Office of Transportation, or EOT) filed a draft Section 404 Permit Application.

[1] 33 CFR 325.3(b)(1)

Subsequently, the Corps issued a Notice of Intent to prepare an EIS in the Federal Register on October 31, 2008. A public notice was issued by the Corps on November 10, 2008 (NAE 2007-00698).

Both NEPA and MEPA require consideration of a reasonable range of alternatives that could meet the project purpose and need and explanation of why alternatives were eliminated from detailed study (40 C.F.R. § 1502.14(a) and MEPA 301 CMR 11.00(f)). This chapter explains the process that led to the Build Alternatives that are evaluated in this FEIS/FEIR.

In addition, the U.S. Environmental Protection Agency, pursuant to its authority under Section 404(b)(1) of the Clean Water Act, developed *Guidelines for Specification of Disposal Sites for Dredged or Fill Material* (USEPA Section 404(b)(1) Guidelines) and codified same under 40 CFR 230 *et seq*. The USEPA Guidelines stipulate that "...no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." The USEPA Section 404(b)(1) Guidelines further define, "practicable" as "available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes." This has generally been interpreted to mean that, in order to comply with the USEPA 404(b)(1) Guidelines, the Corps cannot issue a permit for any project unless it constitutes the least environmentally damaging practicable alternative (LEDPA) for fulfilling the overall project purpose.

The alternatives evaluation described in this chapter was conducted in a manner compatible with the Corps' *Highway Methodology*[2] guidance document to screen alternatives. The Highway Methodology was established to ensure that a transportation agency's preferred alternative under NEPA is consistent with federal wetland regulations, in particular, the Clean Water Act Section 404(b)(1) Guidelines. This chapter also summarizes the characteristics of the alternatives evaluated in this FEIS/FEIR in terms of their anticipated achievement of the overall project purpose, their practicability and their environmental impacts, which together with input from the public and relevant parties will form the basis for the determination of the LEDPA by the Corps.

The alternatives analysis process began with the initial analysis of 65 potential alternatives and subsequent screening, followed by the Corps' Notice Of Intent to prepare an Environmental Impact Statement, the ENF prepared by the applicant, the Certificate on the ENF by the Secretary of the Executive Office Energy and Environmental Affairs (EOEA Secretary) and subsequent studies and analyses during the preparation of the DEIS/DEIR. This process continued through the preparation of the FEIS/FEIR with consideration and analysis of public and agency comments received after publication of the DEIS/DEIR as well as the EOEA Secretary's Certificate on the DEIR.

Throughout this process public, agency and stakeholder input was taken into consideration in the development and evaluation of alternatives, through the federal process, the state environmental review process and public involvement efforts. The Interagency Coordinating Group (ICG)[3] provided an

[2] U.S. Army Corps of Engineers New England Division. 1993. The Highway Methodology Workbook: Integrating Corps Section 404 Permit Requirements with Highway Planning and Engineering and the NEPA EIS Process. Corps Tech. Rpt. NEDEP-360-1-30, 28pp.

[3] The ICG was convened by MassDOT and includes representatives of the United States Army Corps of Engineers; United States Environmental Protection Agency; United States Fish and Wildlife Service; Federal Highway Administration; Federal Transit Administration; National Marine Fisheries Service; Narragansett Indian Tribe; Wampanoag Tribe of Gay Head (Aquinnah); Massachusetts Executive Office of Energy and Environmental Affairs; Massachusetts Environmental Policy Act Office; Massachusetts Bay Transportation Authority; Massachusetts Department of Environmental Protection; Massachusetts Office of Coastal Zone Management; Massachusetts Department of Conservation and Recreation, Areas of Critical Environmental Concern Program; Massachusetts Department of Fish and Game, Natural Heritage and Endangered Species Program; Massachusetts Historical Commission and the Southeastern Regional Planning and Economic Development District.

opportunity for input into the technical analyses for the DEIS/DEIR and was also consulted during the FEIS/FEIR process.

An overview of key steps in the alternatives analysis process is provided below.

3.1.2 Initial (PRE-DEIS/DEIR) Alternatives Analysis Overview

The purpose of the initial alternatives analysis was to identify those alternative concepts that met or exceeded the project evaluation criteria, then to narrow the initial broad range of alternatives to a reasonable number of options that could be carried forward to a more detailed level of analysis in the NEPA/MEPA process.

An initial 65 potential alternatives were identified by reviewing previous studies and soliciting input from the MBTA, the Interagency Coordinating Group, the Commuter Rail Task Force,[4] and interested stakeholders through an extensive civic engagement process conducted by MassDOT. The alternatives are described in detail in the *Analysis of South Coast Rail Alternatives: Phase 1 Report,* Appendix 3.1-A to this FEIS/FEIR. Table 3.1-1, presents the initial list of potential alternatives.[5] Section 3.1.2 of the DEIS/DEIR explained the process of how the alternatives were identified, evaluated, and dismissed or advanced for further evaluation.

These alternatives also included several different components along five main corridors (shown on Figure 3.1-1):

- The Attleboro route (using the active freight rail lines from New Bedford and Fall River to Attleboro, then using the Northeast Corridor from Attleboro to South Station) with a new track bypass or connecting at the existing Attleboro Station.

- The Mansfield route (using the active freight rail lines from New Bedford and Fall River to Taunton, then using the abandoned rail line north to Mansfield Station, then using the active commuter rail line to South Station).

- The Stoughton route (using the active freight rail lines from New Bedford and Fall River to Taunton, then using the inactive rail bed north to Stoughton, then using the active commuter rail tracks to South Station).

- The Middleborough route (using the active freight rail lines from New Bedford and Fall River to the existing Middleborough/Lakeville Station, then using the Old Colony Middleborough Line to South Station)

[4] The Commuter Rail Task Force was formed in 2004 and provides a forum for state officials and local representatives to review and discuss all aspects of the Project and to work toward consensus on strategies and actions to plan ahead for new growth in the region. The Task Force provides advice and assistance to MassDOT and the MBTA in the design of the South Coast Rail Project and in the implementation of the South Coast Rail Economic Development and Land Use Corridor Plan. Its membership includes representatives from the MBTA, regional transit authorities, cities and towns, environmental groups, and business and economic development organizations.

[5] Executive Office of Transportation and Public Works. Analysis of South Coast Rail Alternatives: Phase 1 Report, April 30, 2008.

Table 3.1-1 Initial List of Potential Alternatives

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
THROUGH ATTLEBORO		***ATTLEBORO SECONDARY***			
	1	Commuter Rail to South Station via Attleboro Bypass	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; new track bypass along National Grid right-of-way to tie into Northeast Corridor north of Attleboro station	Advanced for further consideration	Executive Office of Transportation
	2	Commuter Rail to South Station via Attleboro Station with Reverse Move	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary to Northeast Corridor; reverse move at Attleboro Station to merge onto Northeast Corridor	Advanced for further consideration	Executive Office of Transportation
	3	Commuter Rail to South Station via Dartmouth Secondary, New Bedford Secondary, and Attleboro Bypass	Commuter rail along Dartmouth Secondary and New Bedford Mainline north to Cotley Junction, then west along Attleboro Secondary; new track bypass along National Grid right-of-way to tie into Northeast Corridor near Mansfield/Attleboro/Norton town line	Advanced for further consideration	Civic Engagement Process
	4	Bus Rapid Transit to Attleboro Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then adjacent to Attleboro Secondary west; transfer to Northeast Corridor at Attleboro Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	5	Diesel Multiple Units Commuter Rail to Attleboro Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Attleboro Station	Advanced for further consideration	Civic Engagement Process
	6	Diesel Multiple Units to Attleboro Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Attleboro Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	7	Electrified Commuter Rail to South Station via Attleboro Bypass	Electrified commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; new track bypass along National Grid right-of-way to tie into Northeast Corridor near Mansfield/Attleboro/Norton town line	Advanced for further consideration	Civic Engagement Process
	8	Light Rail to Attleboro	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Commuter Rail at Attleboro Station	Similar operational benefits to Alternative 5 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
THROUGH ATTLEBORO	9	Light Rail to Attleboro w/ New Bedford to Fall River connection	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then west along Attleboro Secondary; transfer to Attleboro Station; additional line along Interstate 195 or Dartmouth Secondary between New Bedford and Fall River	Similar operational benefits to Alternative 6 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
	10	Combination Connection to Boston and Providence via Northeast Corridor	Combination of commuter rail on Attleboro Secondary to Boston and commuter bus to connect to Providence, using Interstate 195 corridor	Boston service covered by other alternatives. Providence service does not meet basic project purpose	Civic Engagement Process
	MANSFIELD FORMER RIGHT-OF-WAY				
	11	Commuter Rail to South Station via Mansfield	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, northwest along Attleboro Secondary, then northwest along former right-of-way through Taunton, Norton, and Mansfield to tie into Northeast Corridor near Mansfield Commuter Rail Station	Advanced for further consideration	Corps of Engineers
	12	Bus Rapid Transit to Mansfield Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then adjacent to Attleboro Secondary track, then northwest along former right-of-way through Taunton, Norton, and Mansfield; transfer to Northeast Corridor at Mansfield Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	13	Diesel Multiple Units Commuter Rail to Mansfield Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary, then northwest along former right-of-way through Taunton, Norton, and Mansfield; then transfer to Mansfield Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	14	Diesel Multiple Units to Mansfield Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary to Whittenton Junction, then northwest along former right-of-way through Taunton, Norton, and Mansfield; then transfer to Mansfield Commuter Rail Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	15	Electrified Commuter Rail to South Station via Mansfield	Electrified commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary to Whittenton Junction, then northwest along former right-of-way through Taunton, Norton, and Mansfield to tie into Northeast Corridor near Mansfield Commuter Rail Station	Advanced for further consideration	Civic Engagement Process

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
THROUGH MIDDLEBOROUGH	16	Light Rail to Mansfield	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then northwest along Attleboro Secondary to Whittenton Junction, then northwest along former right-of-way through Taunton, Norton, and Mansfield; then transfer to Mansfield Commuter Rail Station	Similar operational benefits to Alternative 13 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
	MIDDLEBOROUGH SECONDARY				
	17	Commuter Rail to South Station via Middleborough	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line	Advanced for further consideration	Executive Office of Transportation
	18	Commuter Rail to South Station via Middleborough, convert Red Line Braintree Branch to Commuter Rail	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line at new Middleborough/Lakeville Commuter Rail Station relocated north; convert Red Line Braintree Branch to commuter rail	Advanced for further consideration	Civic Engagement Process
	19	Heavy Rail to Middleborough	Extend the Red Line to Middleborough/Lakeville Station via the Middleborough Commuter Rail Line with feeder bus from New Bedford and Fall River	Variation of Alternative 61 (greater infrastructure requirements with no transportation benefits)	Civic Engagement Process
	20	Bus Rapid Transit to Middleborough/Lakeville Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then east adjacent to Middleborough Secondary; transfer to Middleborough Line at Middleborough/Lakeville Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	21	Diesel Multiple Units Commuter Rail to Middleborough/Lakeville Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary; transfer to Middleborough/Lakeville Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	22	Diesel Multiple Units to Middleborough/Lakeville Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary; transfer to Middleborough/Lakeville Commuter Rail Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	23	Commuter Rail to South Station via Middleborough (via Cotley) -w/ reverse	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line just north of Middleborough/Lakeville Commuter Rail Station w/	Variation of Alternative 17 (similar infrastructure requirements with no transportation benefits)	Executive Office of Transportation

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
THROUGH MIDDLEBOROUGH		move	reverse move to serve Middleborough/Lakeville Station		
	24	Light Rail to Middleborough (via Cotley)	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary; transfer to Middleborough/Lakeville Commuter Rail Station	Similar operational benefits to Alternative 21 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
	63	Commuter Rail to South Station via Middleborough, also extend Middleborough line to Wareham	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line; then extend Middleborough Commuter Rail Line to Wareham and/or Buzzards Bay	Advanced for further consideration	Civic Engagement Process
	64	Commuter Rail to South Station via Middleborough without Old Colony Main Line Improvements	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then east along Middleborough Secondary to tie into Middleborough Line; no improvements to Old Colony Main Line	Advanced for further consideration	Interagency Coordinating Group
	MIDDLEBOROUGH FORMER RIGHT-OF-WAY				
	25	Commuter Rail to South Station via Middleborough (via Myricks)	Commuter rail along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville to tie into Middleborough Line at new Middleborough/Lakeville Commuter Rail Station relocated north	Variation of Alternative 17 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
	26	Commuter Rail to South Station via Middleborough (via Myricks) -w/ reverse move	Commuter rail along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville to tie into Middleborough Line just north of Middleborough/Lakeville Commuter Rail Station w/ reverse move to serve Middleborough/Lakeville Station	Variation of Alternative 17 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
	27	Light Rail to Middleborough (via Myricks)	Light rail transit along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville; transfer to Middleborough/Lakeville Commuter Rail Station	Similar operational benefits to Alternative 21 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
THROUGH STOUGHTON	28	Bus Rapid Transit to Middleborough (via Myricks)	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville; transfer to Middleborough Line at Middleborough/Lakeville Commuter Rail Station	Variation of Alternative 20 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
	29	Diesel Multiple Units Commuter Rail to Middleborough (via Myricks)	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Myricks Junction, then northeast along former right-of-way parallel to Route 79 through Berkley and Lakeville; transfer to Middleborough/Lakeville Commuter Rail Station	Variation of Alternative 21 with minimal transportation improvements and significant environmental impacts (right-of-way takings)	Civic Engagement Process
	30	Commuter Rail to South Station via Stoughton	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton to tie into Stoughton Line at Stoughton Commuter Rail Station	Advanced for further consideration	Executive Office of Transportation
	31	Bus Rapid Transit to Stoughton Station	Bus Rapid Transit adjacent to New Bedford Main Line track and Fall River Secondary track north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Line at Stoughton Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	32	Diesel Multiple Units Commuter Rail to Stoughton Station	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	33	Diesel Multiple Units to Stoughton Station with New Bedford to Fall River Connection via Dartmouth Secondary	Diesel Multiple Units commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Commuter Rail Station; additional line along Dartmouth Secondary between New Bedford and Fall River	Advanced for further consideration	Civic Engagement Process
	34	Electrified Commuter Rail to South Station via Stoughton	Electrified commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton to tie into Stoughton Line at Stoughton Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
THROUGH STOUGHTON	35	Commuter Rail to South Station via Stoughton (Whittenton Branch)	Variation on Stoughton Alternative using Whittenton Branch and Attleboro Secondary to avoid the Pine Swamp	Variation of Alternative 30 with similar transportation benefits (could be evaluated in Phase 2 as option to Alternative 30	Corps of Engineers

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
THROUGH ATTLEBOROAND MIDDLEBOROUGH	36	Light Rail to Stoughton	Light rail transit along New Bedford Main Line and Fall River Secondary north to Cotley Junction, then north along existing right-of-way through Raynham, Easton, and Stoughton; transfer to Stoughton Commuter Rail Station	Similar operational benefits to Alternative 32 but requires additional infrastructure due to incompatibility of light rail vehicles operating on national rail network	Civic Engagement Process
	62	Commuter Rail to South Station via Attleboro Bypass and Middleborough Line	Commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction; then one branch west along Attleboro Secondary with new track bypass along National Grid right-of-way to tie into Northeast Corridor north of Attleboro station; second branch along Middleborough Secondary to tie into Middleborough Line just north of Middleborough/Lakeville	Advanced for further consideration	Executive Office of Transportation
	65	Electrified Commuter Rail to South Station via Attleboro and Middleborough	Diesel and electric commuter rail along New Bedford Main Line and Fall River Secondary north to Cotley Junction; then one electric branch west along Attleboro Secondary with new track bypass along National Grid right-of-way to tie into Northeast Corridor north of Attleboro station; one diesel branch along Middleborough Secondary to tie into Middleborough Line just north of Middleborough/Lakeville Station (Middleborough Line not electrified)	Advanced for further consideration	Interagency Coordinating Group
USING HIGHWAY SYSTEM	37	Monorail to South Station via Route 140, Route 24, Route 128, and Southeast Expressway	Monorail along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east and Southeast Expressway right-of-way north to South Station	Advanced for further consideration	Civic Engagement Process
	38	Monorail to Quincy Adams Station via Route 140, Route 24, and Route 128	Monorail along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; transfer to Quincy Adams Red Line Station	Advanced for further consideration	Civic Engagement Process
	39	Monorail to Route 128 Station via Route 140, Route 24, and Route 128	Monorail along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
USING HIGHWAY SYSTEM	40	Commuter Rail to South Station via Route 24 and Route 128 to Northeast Corridor	Commuter rail along New Bedford Main Line and Fall River Secondary north to just south of Cotley Junction, then new track along Route 24 right-of-way north to Randolph and along Route 128/I-93 right-of-way west; tie into Northeast Corridor north of Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	41	Light Rail/Heavy Rail to Route 128 Station via Route 140, Route 24, and Route 128	Heavy or light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	42	Heavy Rail to South Station via Route 140, Route 24, Route 128, and Red Line	Heavy rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; tie into Red Line at Quincy Adams Red Line Station	Advanced for further consideration	Civic Engagement Process
	43	Express Bus in Dedicated Lane to Route 128 Station via Route 24 and Route 128	Add HOV lanes on Route 24 from Interstate 495 north to Randolph, then on Route 128 west; transfer to Route 128 Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	44	Express Bus in Dedicated Lane to South Station via Route 24, Route 128, and Southeast	Add HOV lanes on Route 24 from Interstate 495 north to Randolph, then on Route 128/93 east to Southeast Expressway HOV Lane to South Station	Advanced for further consideration	Civic Engagement Process
	45	Enhanced Bus Service on Existing Private Carrier Routes	Increased bus service and increased parking for bus commuters along existing private bus carrier lines from Fall River, New Bedford, and Taunton to South Station	Advanced for further consideration	Executive Office of Transportation
	46	Light Rail to Route 128 Station	Light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Included in Alternative 41	Civic Engagement Process
	47	Light Rail to Quincy Adams Station	Light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; transfer to Quincy Adams Red Line Station	Provides fewer transportation benefits (requires transfer) than Alternative 42 with similar environmental impacts/benefits	Civic Engagement Process
	48	Light Rail to South Station	Light rail transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east and Southeast Expressway right-of-way north	Provides similar transportation benefits to HOV lane and similar environmental impacts	Civic Engagement Process

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
USING HIGHWAY SYSTEM (cont'd)			to South Station	than Alternative 43	
	49	Bus Lane to Route 128	Bus lanes on Route 24 from 495 north to Randolph, then on Route 128 west; transfer to Route 128 Commuter Rail Station	Same transportation and environmental benefits as Alternative 43	Civic Engagement Process
	50	Bus Lane to South Station	Bus lanes on Route 24 from 495 north to Randolph, then on Route 128/93 east to Southeast Expressway HOV Lane to South Station	Same transportation and environmental benefits as Alternative 44	Civic Engagement Process
	51	Combination Connection to Boston and Providence via Route 24	Combination of commuter bus services along I-195 and Routes 24/140 to connect South Coast cities with Providence and Boston	Boston service covered by other alternatives. Providence service does not meet basic project purpose	Civic Engagement Process
	52	Park-and-Ride Improvements	Improve the Park-and-Ride system serving the South Coast	Not a public transit alternative. Does not meet basic project purpose	Civic Engagement Process
	53	Advanced Rapid Transit to Route 128 Station	Advanced rapid transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128 right-of-way west; transfer to Route 128 Commuter Rail Station	Provides same transportation and environmental benefits/impacts as Alternative 37 (could be evaluated in Phase 2 as option to Alternative 37)	Civic Engagement Process
	54	Advanced Rapid Transit to Quincy Adams Station	Advanced rapid transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east; transfer to Quincy Adams Red Line Station	Provides same transportation and environmental benefits/impacts as Alternative 38 (could be evaluated in Phase 2 as option to Alternative 38)	Civic Engagement Process
	55	Advanced Rapid Transit to South Station	Advanced rapid transit along Routes 24/140 right-of-way from Fall River/New Bedford north to Randolph, then along Route 128/93 right-of-way east and Southeast Expressway right-of-way north to South Station	Provides same transportation and environmental benefits/impacts as Alternative 39 (could be evaluated in Phase 2 as option to Alternative 39)	Civic Engagement Process
Other	56	Commuter Rail to South Station via Providence	Commuter rail along Dartmouth Secondary and old right-of-way through Rhode Island to Providence; tie into Northeast Corridor just north of Providence Commuter Rail Station	Advanced for further consideration	Civic Engagement Process
	57	Enhanced bus on Interstate 195	Public transit service along Interstate 195 between Wareham and Providence	Advanced for further consideration	Civic Engagement Process

Route	Alt #	Name	Description	How the Alternative was Addressed	Origin
Other	58	Commuter Rail to Wareham via Middleborough	Extend the Middleborough Commuter Rail Line to Wareham and/or Buzzards Bay	Advanced for further consideration	Civic Engagement Process
	59	Appoint a czar		Not a public transportation alternative	Civic Engagement Process
	60	Encourage Telecommuting/Video Conferencing		Not a public transportation alternative	Civic Engagement Process
	61	Feeder Bus Network to Middleborough/Lakeville Station	Feeder bus network from New Bedford/Fall River area feeding into existing commuter rail network (may require new station)	Advanced for further consideration	Interagency Coordinating Group

- The Highway route (using Routes 140, 79, 24, 128, and I-93 to the existing Route 128 commuter rail station, the existing Quincy Adams Red Line station, or South Station).

These 65 alternatives were combined into 38 alternatives (Table 3.1-2) by grouping similar alternatives together and dismissing alternatives that were not transportation alternatives. For supporting information on methodology used to develop the ratings shown in Table 3.1-2, refer to Analysis of South Coast Rail Alternatives: Phase 1 Report, Appendix 3.1-A to this FEIS/FEIR.

The alternatives analysis also evaluated using other transportation corridors, including the Dartmouth Secondary (a partially active and partially abandoned freight rail line between New Bedford and Fall River); Interstate 195 between New Bedford and Providence; and active freight rail lines between Lakeville and Wareham.

At the conclusion of the ENF review and public scoping process, the Secretary of the Executive Office of EEA on April 3, 2009 issued a Certificate that specified the analyses, studies, and information to be included in the DEIR and the alternatives to be evaluated:

- No-Build Alternative (Enhanced Bus)
- Attleboro Electric Alternative (Previously referred to as Alternative 1, Option 1B)
- Attleboro Diesel Alternative (Previously referred to as Alternative 1, Option 1A)
- Stoughton Electric Alternative (Previously referred to as Alternative 4, Option 4B)
- Stoughton Diesel Alternative (Previously referred to as Alternative 4, Option 4A)
- Whittenton Electric Alternative (Alternative 4, Option 4D)
- Whittenton Diesel Alternative (Previously referred to as Alternative 4, Option 4C)
- Rapid Bus Alternative (Previously referred to as Alternative 5, Rapid Bus)

Table 3.1-2 Initial Screening List of 38 Alternatives

Route	Alt #	Name	Step 1 Analysis - *Would the Proposed Alternative Achieve the Project Purpose?*	Step 2 Analysis - *Is the Proposed Alternative Practicable?*	Step 3 Analysis - *Compare the Magnitude of Impacts to the natural Environment and Consistency with Smart Growth*
THROUGH ATTLEBORO OR MANSFIELD		*ATTLEBORO SECONDARY*			
	1	Commuter Rail to South Station via Attleboro Bypass	◑	○	○
	2	Commuter Rail to South Station via Attleboro Station with Reverse Move	○	⊗	
	3	Commuter Rail to South Station via Dartmouth Secondary, New Bedford Secondary, and Attleboro Bypass	◑	○	⊗
	4	Bus Rapid Transit to Attleboro Station	⊗		
	5	Diesel Multiple Units Commuter Rail to Attleboro Station	○	○	◑
	6	Diesel Multiple Units to Attleboro Station with New Bedford to Fall River Connection via Dartmouth Secondary	◑	○	⊗
	7	Electrified Commuter Rail to South Station via Attleboro Bypass	◑	○	○
		MANSFIELD FORMER RIGHT-OF-WAY			
	11	Commuter Rail to South Station via Mansfield	◑	⊗	
	12	Bus Rapid Transit to Mansfield Station	○	⊗	
	13	Diesel Multiple Units Commuter Rail to Mansfield Station	○	⊗	
	14	Diesel Multiple Units to Mansfield Station with New Bedford to Fall River Connection via Dartmouth Secondary	◑	⊗	
	15	Electrified Commuter Rail to South Station via Mansfield	◑	⊗	
THROUGH MIDDLEBOROUGH		*MIDDLEBOROUGH SECONDARY*			
	17	Commuter Rail to South Station via Middleborough	◑	⊗[1]	◑
	18	Commuter Rail to South Station via Middleborough, convert Red Line Braintree Branch to Commuter Rail	◑	⊗	
	20	Bus Rapid Transit to Middleborough/Lakeville Station	⊗		
	21	Diesel Multiple Units Commuter Rail to Middleborough/Lakeville Station	⊘		
	22	Diesel Multiple Units to Middleborough/Lakeville Station with New Bedford to Fall River Connection via Dartmouth Secondary	⊘		
	63	Commuter Rail to South Station via Middleborough, also extend Middleborough line to Wareham	◑	⊗	
	64	Commuter Rail to South Station via Middleborough without Old Colony Main Line Improvements	◑	○	◑
THROUGH ATTLEBORO AND MIDDLEBOROUGH	62	Commuter Rail to South Station via both Attleboro Bypass and Middleborough Line	◑	◑	○
THROUGH STOUGHTON	30	Commuter Rail to South Station via Stoughton	◑	◑	⊘
	31	Bus Rapid Transit to Stoughton Station	⊘		
	32	Diesel Multiple Units Commuter Rail to Stoughton Station	○	○	⊗
	33	Diesel Multiple Units to Stoughton Station with New Bedford to Fall River Connection via Dartmouth Secondary	◑	○	⊗
	34	Electrified Commuter Rail to South Station via Stoughton	◑	◑	⊘
USING HIGHWAY SYSTEM	37	Monorail to South Station via Route 140, Route 24, Route 128, and Southeast Expressway	◑	⊗	
	38	Monorail to Quincy Adams Station via Route 140, Route 24, and Route 128	○	⊗	
	39	Monorail to Route 128 Station via Route 140, Route 24, and Route 128	○	⊗	
	40	Commuter Rail to South Station via Route 24 and Route 128 to Northeast Corridor	◑	⊗	
	41	Light Rail/Heavy Rail to Route 128 Station via Route 140, Route 24, and Route 128	○	⊗	
	42	Heavy Rail to South Station via Route 140, Route 24, Route 128, and Red Line	◑	⊗	
	43	Express Bus in Dedicated Lane to Route 128 Station via Route 24 and Route 128	○	○	◑
	44	Express Bus in Dedicated Lane to South Station via Route 24, Route 128, and Southeast Expressway HOV Lane	◑	○	◑
	45	Enhanced Bus Service on Existing Private Carrier Routes	◑	◑	◑
Other	56	Commuter Rail to South Station via Providence	⊗		
	57	Enhanced bus on Interstate 195	⊗		
	58	Commuter Rail to Wareham via Middleborough	⊗		
	61	Feeder Bus Network to Middleborough/Lakeville Station	⊘		

LEGEND
- ● **Highly Favorable**
- ◑ **Favorable**
- ○ **Neutral**
- ⊘ **Unfavorable** (Step 1 alternatives resulting in unfavorable designations were dismissed from further consideration in Phase 1)
- ⊗ **Highly Unfavorable** (Any alternative resulting in highly unfavorable designations were dismissed from further consideration in Phase 1)
- [shaded box] Alternative dismissed from further consideration
- 1 Alternative 17 was removed from further consideration in Step 2, Part 1 but was carried forward to Step 2, Part 2 for comparison purposes at the request of EOT.

The Secretary's certificate and the public and agency comments received in response to the Notice of Intent, ENF, as well as other comments and input from agencies through the Interagency Coordinating Group (ICG) and other channels were taken into consideration by the Corps in its subsequent preparation of the DEIS/DEIR. The Corps and the Executive Office of EEA reached consensus that the above alternatives should be evaluated in the DEIS/DEIR; however, before concluding that they represented a sufficient suite of alternatives to study in detail, the Corps examined an additional permutation. Specifically, during the preparation of the DEIS/DEIR a new alternative that combined the Middleborough Simple Rail Alternative (ENF Alternative 2) with the Rapid Bus Alternative (ENF Alternative 5) was evaluated at the request of EPA. The evaluation (provided in Appendix 3.1--B) indicated that complementing the low ridership of the Middleborough Simple Alternative with the ridership of the Rapid Bus Alternative would result in a combined ridership for the Hybrid Alternative less than that of the Rapid Bus Alternative by itself and just slightly more than the Middleboro Simple Alternative (which was already considered underperforming in terms of ridership). The combination alternative would require much of the infrastructure improvements needed for each individual alternative, resulting in a higher cost of the hybrid alternative than either the Rapid Bus Alternative or the Middleboro Simple Alternative. This would render the cost of the combination alternative not practicable considering costs and logistics in light of overall project purposes (i.e., fewer riders but higher cost of either Rapid Bus or Middleboro Simple alone). This alternative was therefore not advanced for further analysis in the DEIS/DEIR.

Along with the identification of alternative alignments, described in Section 3.1 of the DEIS/DEIR, potential station sites were identified, as described in Section 3.1.4 of the DEIS/DEIR with further detail in the Station Siting Report (FEIS/FEIR Appendix 3.1-C).[6]

3.1.2.1 Station Site Screening

Potential station locations to serve each of the five public transportation alternatives were identified and evaluated with regard to their ability to meet the purpose and need under NEPA, and the overall project purpose under the USEPA Section 404(b)(1) Guidelines pursuant to 40 CFR 230.10(a)(2).

Potential station locations for each of the alternatives were identified early in the process in order to identify potential environmental issues and to be able to calculate the number of riders projected to use each of the alternatives. The number of riders was projected by CTPS using the regional ridership/travel demand computer model commonly used forecast the number of users of a new transit service. The model is based on demographic and geographical factors and service quality variables. Identification of potential station locations also provided insight into the economic development potential of each alternative and opportunities to support economic development in accordance with Smart Growth principles.[7] In addition to the consideration above, a list of guiding principles was used in station screening, consistent with the Commonwealth's Sustainable Development Principles[8,] as described in the Station Siting Report.

Potential station locations for the South Coast Rail alternatives were initially identified by SRPEDD,[9] and screened in an iterative process by the multi-disciplinary project team. SRPEDD staff with input from the public identified a total of 73 rail and bus station locations, some of which overlapped, totaling 55 rail stations and 30 bus stations. The locations identified and remaining in the FEIS/FEIR analysis include

[6] Station Siting Report. EOT's Final Recommendations (October 10, 2008).
[7] http://www.epa.gov/smartgrowth/about_sg.htm.
[8] http://www.mass.gov/envir/smart_growth_toolkit/pdf/patrick-principles.pdf.
[9] SRPEDD is a regional planning agency serving 27 cities and towns in Southeastern Massachusetts.

stations that are located on all potential rail segments, including the Fall River Secondary, New Bedford Main Line, the rail bed that extends south of the Stoughton Station, Whittenton Branch variation on the Stoughton Alternative, and the Attleboro Secondary.

3.1.3 Alternatives Analyzed in the DEIS/DEIR

The following alternatives were analyzed in the DEIS/DEIR. Evaluation of these alternatives was required by the Corps and the Executive Office of EEA, and defined in the MEPA certificate. The alternatives analyzed in the DEIS/DEIR were distinguished between No-Build and Build. Among the Build Alternatives there was a rail mode and a bus mode. Within the rail mode, there were three different corridors (Attleboro, Stoughton and Whittenton) and two different propulsion alternatives: electrically powered and diesel powered, as follows:

- **No-Build (Enhanced Bus) Alternative**
- **Commuter Rail Alternatives**
  - **Attleboro Alternatives**
    - Attleboro Electric
    - Attleboro Diesel
  - **Stoughton Alternatives**
    - Stoughton Electric
    - Stoughton Diesel
  - **Whittenton Alternatives**
    - Whittenton Electric
    - Whittenton Diesel
- **Rapid Bus Alternative**

Figure 3.1-2 provides an overview of the alignments of the alternatives analyzed in the DEIS/DEIR.

The corridor for the Whittenton Alternative is a variant of the Stoughton Alternative. The Whittenton Alternative corridor avoids the Pine Swamp by using the abandoned Whittenton Branch right-of-way. It is identical to the Stoughton Alternative corridor in all other respects.

During the DEIS/DEIR analysis, conceptual operating plans, capital improvement requirements, capital costs, and operating and maintenance costs were developed for each alternative. The DEIS/DEIR alternatives were modeled using the CTPS regional transportation model, providing quantitative results on the performance of each alternative in terms of ridership, highway/vehicular travel, air quality, and environmental justice. Detailed analyses of environmental impacts (to natural resources, air quality, noise and vibration, historic resources, social and economic impacts among others) were conducted. Smart growth strategies were as identified in the South Coast Rail Corridor Plan were evaluated for all Build Alternatives analyzed in the DEIS/DEIR. A detailed description of the alternatives analyzed in the DEIS/DEIR was provided in Section 3.2 of the DEIS/DEIR. Section 3.3 of the DEIS/DEIR summarized the characteristics of each alternative with regard to their achievement of the project purpose and

associated goals and objectives, their practicability and their beneficial effects and environmental impacts.

3.1.4 Comments on the DEIS/DEIR

The DEIS/DEIR was published on February Notice of Availability was published in the Federal Register on March 25, 2011 and made available at various repositories including public libraries, and distributed in hard copy and electronically and on the Corps' web site. The Corps issued a Public Notice on the project on March 23, 2011, coinciding with the MEPA notice in the *Environmental Monitor.* A public comment period ensued following publication of the DEIS/DEIR, inviting written comments on the DEIS/DEIR. Verbal comments were solicited during two public hearings on the DEIS/DEIR. A description of the public and agency involvement following publication of the DEIS/DEIR is provided in Chapter 9, *Public Involvement and Agency Coordination*.

3.1.4.1 Requirements of the Secretary's Certificate

In the Draft Massachusetts Environmental Policy Act Certificate issued on June 2011, the Secretary of Energy and Environmental Affairs stated the following: "I am satisfied that MassDOT has made the case for the Stoughton Route to be brought forward as the preferred alternative in the FEIR…. MassDOT did not identify the preferred mode among the diesel and electric alternatives. However, because the electric option is preferable from an air quality perspective, the Stoughton Electric should be the focus of the FEIR." The Stoughton Alternative is MassDOT's preferred alternative, however MassDOT has not identified a preferred mode (diesel or electric), as discussed in MassDOT's Preface to the FEIS/FEIR.

USACE must comply with NEPA and the Section 404(b)(1) Guidelines, and therefore has different regulatory requirements with respect to alternatives evaluations than the state requirements applicable to MassDOT under MEPA. The FEIS/FEIR analyzes both the Stoughton and Whittenton Alternatives. In addition to electric rail alternatives, the FEIS/FEIR also evaluates the diesel variants to inform the USACE in making its Least Environmentally Damaging Preferred Alternative (LEDPA) determination.

The Secretary's Certificate also requested that the FEIR address the comments listed below. Volume III of this FEIS/FEIR provides detailed responses to all relevant requirements of the Certificate.

- The FEIR should expand on the analysis of the proposed layover facilities with detailed plans for the layover facilities and a comparative analysis of environmental impacts. The FEIR should include a rationale for selection of the preferred layover facilities and for elimination of others from further consideration.

- The FEIR should describe MassDOT's work with the City of New Bedford to develop a feeder bus system and discuss the additional benefits of the system including potential increases in ridership.

- The FEIR should also clarify the enhanced bus measures assumed as part of the No-Build scenario.

- Several stations do not include accommodations for feeder bus. The FEIR should explain this and consider measures to enhance shuttle/feeder bus service to the proposed stations.

- The FEIR should include additional information on station sites, including analysis of decked parking.
- The FEIR should include additional detail on plans to support pedestrian and bicycle access.
- The FEIR should clarify the annual operating schedule for the Battleship Cove Station.
- The FEIR should clarify whether freight currently exists at these [station] sites or not, and if there are any changes to freight routes as a result of the proposed project.
- The FEIR should evaluate the engineering feasibility of constructing the proposed trestle in wetland soils and evaluate the feasibility of constructing a trestle through Pine swamp. The FEIR should also discuss how access will be achieved for any maintenance or emergency situations along the rail right-of-way, including sections of the rail located in the Hockomock and Pine Swamps.

3.1.4.2 Other Comments on the DEIS/DEIR

Other comments on the DEIS/DEIR are summarized below. Volume III of this FEIS/FEIR provides detailed responses to all relevant comments.

- Provide a description of bridge construction techniques and address potential impacts from in-water construction.
- Describe the potential for upgraded at-grade crossing treatments to eliminate the need for whistles and horns within populated areas.
- Provide additional design information regarding the physical improvements, including structures, visual impacts to abutters, and right-of-way impacts associated with the implementation of the electric rail alternatives.
- Provide additional information related to the revised parking layouts at Canton Center Station associated with the Stoughton/Whittenton Alternatives.
- Describe potential construction impacts associated with the construction of new stations and modification of existing stations associated with the Stoughton/Whittenton Alternatives.
- Provide a graphic that shows track assumptions (e.g. single track/dual track and other relevant alignment aspects that affect travel time, including side spurs). Information is needed as to whether or not single tracking in these areas has been fully considered in the calculation of travel time.
- Identify the width of the right-of-way and width of (construction and operation) disturbance of proposed alternatives. Clarify whether all work (construction and maintenance) will fall within the right-of-way and delineate the construction and maintenance zone.
- Include in the capital and operations and maintenance cost of each alternative the costs of mitigation and the financing to construct, operate and maintain each alternative.

- Provide updated or additional information about maintenance and fueling requirements and facilities (fueling stations, inspection tracks and crew quarters, rolling stock maintenance) and how those needs may affect the requirements for a layover facility in Boston.
- Provide updated design plans for station sites with additional information on proposed Transit-oriented Development (TOD).
- Provide a Finance Plan, describe impacts on South Station, describe construction impacts to commuter rail and freight service, and provide a (stations) Parking Plan.
- Describe the feasibility of project phasing, such as sequential completion of lines south of Boston, eventually reaching both Fall River and New Bedford.
- Provide additional information on the number of existing and forecasted freight and passenger trips during the weekday and weekends, with specific attention to the number of existing and future passenger trips at South Station.
- Clarify the specific future improvements and service modifications to the rail corridors that were assumed to be in place for calculating the travel times of rail alternatives (including the No-Build Alternative) by 2030.
- Update the construction schedule for the alternatives and clarify the basis for changes in the construction schedule or lack thereof.
- Provide more specific information regarding freight service under the Stoughton/Whittenton Alternatives, including (if freight service would occur) the hours of operation and potential cargo.
- Provide additional documentation regarding the operational feasibility of the Rapid Bus Alternative, potential necessary improvements and their associated costs, schedule and environmental impacts, both for the Rapid Bus Alternative proposed in the DEIS and any modifications thereto (the additional evaluations of the Rapid Bus Alternative are described below in Section 3.1.5)
- Provide information on the No-Build (Enhanced Bus) Alternative similar to that provided for the Build Alternatives in Section 3.3.
- Provide the mitigation costs associated with the Stoughton, Whittenton and Rapid Bus Alternatives (so they can be incorporated in DEIS Table 3.3-11). Including any additional mitigation costs informed by impact analyses conducted after the DEIS/DEIR was published, including mitigation costs associated with indirect impacts.
- Clarify changes, if any, in cost per rider estimates for the Rapid Bus Alternative and other alternatives, as applicable, in the DEIS relative to earlier (pre-DEIS) estimates.
- Provide a discussion of areas like Route 24 where the bus will operate in its own designated lane and whether the bus route can be designed to operate safely at higher speeds to reduce overall travel time.

- Identify measures to reduce congestion that the bus service will face as it enters the mixed traffic portion of its route along the Southeast Expressway.
- Confirm that rapid bus vehicles would incorporate passenger comfort and convenience features (such as Wi-Fi).
- Conduct further evaluation of issues associated with the Rapid Bus Alternative to determine the extent to which there could be improvements in that alternative's overall performance.
- Clarify whether any one change or combination of changes, to the Rapid Bus Alternative would result in a meaningful change in ridership.
- Provide information on the feasibility and ridership effects of a connection between the proposed Rapid Bus service and the MBTA's Orange Line.
- Provide information on the feasibility and ridership effects of additional stations in areas of proposed growth.
- Clarify the specific (traffic/congestion/roadway configuration) data and how this caused an increase in reported Rapid Bus travel time compared to previous analyses.
- Update on-time arrival data of existing services to reflect more current data and clarify how on-time performance data relates to the total estimated travel time of proposed alternatives and their on-time performance.
- Clarify the definitions of the South Coast Region for different purposes, including the definition of the South Coast Region that was used to calculate the (8,000) daily work trips to the Boston area and how the ridership demand for a region relates to the ridership demand for a specific service/alternative.

3.1.5 Alternatives Eliminated following the DEIS/DEIR

This section briefly describes the alternatives eliminated from further analysis following the DEIS/DEIR and the rationale for not advancing these alternatives to this FEIS/FEIR.

3.1.5.1 Attleboro Alternatives

The Attleboro Alternative would provide commuter rail service to South Station using the Northeast Corridor, proposed Attleboro Bypass, Attleboro Secondary, New Bedford Main Line, and Fall River Secondary. Both electric (Attleboro Electric) and diesel (Attleboro Diesel) commuter rail options were evaluated for this alternative. The New Bedford route would be 60.4 miles long and the Fall River route would be 57.9 miles long.

The Attleboro Alternative (electric and diesel) would include eight new commuter rail stations (Barrowsville, Downtown Taunton, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction at three existing commuter rail stations (Canton Junction, Sharon, Mansfield) as well as minor work at the existing commuter rail station at Route 128.

The Attleboro Alternatives would require improvements to track infrastructure along the Northeast Corridor (construction of a third track between the proposed Attleboro Bypass and the Readville

Interlocking in Boston, a distance of 18.7 miles); the Attleboro Bypass (a new two-track railroad on a new right-of-way between the Northeast Corridor and the Attleboro Secondary, a distance of 2.8 miles); and the Attleboro Secondary (reconstruction of existing tracks from the Attleboro Bypass to Weir Junction, as a single track with one siding, a distance of 9.7 miles). This alternative also requires reconstructing track on the Southern Triangle, which is common to all rail alternatives, including the New Bedford Main Line (reconstruct existing tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction and single track with three sidings from Myricks Junction to New Bedford, a distance of 18.9 miles); and the Fall River Secondary (reconstruct existing tracks from Myricks Junction to Fall River, as single track with three sidings, a distance of 11.8 mile).

Based on RAILSIM capacity simulations, the Attleboro Alternatives would operate with very poor on-time performance (especially in the evening peak period) (See Appendix 3.1-D). The analysis indicated that the Attleboro Alternatives would be operationally infeasible as they would not meet the MBTA on-time standard in the morning peak and would experience even worse on time performance during the evening peak commute. The Attleboro Alternatives would also contribute to a cascading negative impact on the on-time performance of the entire southerly commuter rail system, including Worcester, Franklin, Needham, and Providence commuter rail lines.

In order to address the operational infeasibility of the Attleboro Alternative, capacity on the Northeast Corridor (NEC) would have to be increased through construction of a fourth track along the NEC between Forest Hills Station and Back Bay Station. An analysis was conducted in the DEIS/DEIR of the construction costs and schedule implications as well as key property and other impacts associated with the construction of a fourth track.

The analysis in the DEIS/DEIR (Section 1.4.6.2) indicated that the potential impacts, construction costs and construction schedule and other aspects of the fourth track along the NEC would render implementation of this infrastructure requirement not practicable considering costs, existing technology and logistics in light of overall project purposes. In a previous study, the Federal Railroad Administration (FRA; a cooperating federal agency) also explored the option to expand capacity of the NEC north of Canton Junction Station. However, due to substantial constraints, it was proposed that such capacity expansion end at Forest Hills in Jamaica Plain. In reviewing the RAILSIM capacity simulations conducted for the Attleboro Alternative, the FRA indicated to the Corps during the preparation of the DEIS/DEIR that it considered the Attleboro Alternatives infeasible and appropriate to eliminate from further environmental review/ consideration.[10]

3.1.5.2 Rapid Bus Alternative

As proposed at the time of the DEIS/DEIR, the Rapid Bus Alternative would provide commuter bus service to South Station via I-93, Route 140 and Route 24. North of I-495, buses would use a combination of new zipper bus lanes, new reversible bus lanes, two-way bus lanes, existing zipper HOV lanes, and existing HOV lanes, along with a short section in mixed traffic. South of the I-495 interchange in Raynham, buses would travel in the general purpose lanes with mixed traffic. The New Bedford route would be 56.4 miles long and the Fall River route would be 51.5 miles long.

This alternative requires improvements to highway infrastructure along Route 24 (construct third lane from Route 140 to I-495, a distance of 5.8 miles; widen Route 24 to accommodate movable barriers; construct zipper bus lane from I-495 to Harrison Boulevard, a distance of 15.4 miles); and Route 128/I-

[10] Email correspondence from FRA to Army Corps. March 3, 2010.

93 (construct reversible bus lane from Harrison Boulevard on Route 24 to Logan Express Lot, a distance of 4.2 miles; and construct two-lane bus roadway from Logan Express Lot to existing HOV zipper lane on the Southeast Expressway, a distance of 1.6 miles). Infrastructure improvements also include constructing, reconstructing, or widening 20 bridges and reconstructing 11 highway interchanges.

This alternative would include six new rapid bus stations (Downtown Taunton, Galleria Station, King's Highway, Whale's Tooth, Freetown and Fall River Depot).

After publication of the DEIS/DEIR several comments were received on the Rapid Bus Alternative described and analyzed in the DEIS/DEIR, prompting additional analysis of this alternative. The comments received on the DEIS/DEIR Rapid Bus Alternative can be summarized as follows:

Performance: Travel speed of the DEIS/DEIR Rapid Bus Alternative was identified as too slow. The slow travel speed did not make the alternative competitive with rail. Further analysis of speed improvements was requested, including additional opportunities for the Rapid Bus Alternative to operate in its own designated lane or at higher speeds. Overall reductions in travel time would be the objective of these modifications.

Congestion: It was noted that the Rapid Bus Alternative was subjected to congestion "hot spots," which would affect its projected travel time and reliability. It was suggested that the Rapid Bus Alternative include additional measures to address congestion.

Ridership: Ridership on the Rapid Bus Alternative was noted as being lower than the commuter rail alternatives. The May 2010 memo from Central Transportation Planning Staff (CTPS) accompanying the projections indicated the following major factors contributing to lower performance of the Rapid Bus Alternative than the commuter rail alternatives:

1. Run times of the Rapid Bus Alternative are longer to South Station than commuter rail alternatives;
2. The commuter rail alternatives serve several more stations than the Rapid Bus Alternative ;
3. Lack of connectivity of the Rapid Bus Alternative with the Orange Line;
4. Transfer times between the Rapid Bus Alternative and the rapid transit lines are a little longer than with the commuter lines;
5. The Rapid Bus Alternative would include fewer new stations in areas of projected growth compared to the commuter rail alternatives
6. The Rapid Bus Alternative's lack of intra-regional connectivity/no intermediate stations, compared to the commuter rail alternatives.

As described in the DEIS/DEIR the Rapid Bus Alternative had by far the lowest ridership among the alternatives, while having the greatest impact on wetlands (a loss of 21.5 acres of wetlands, of which 4.0 acres were in state designated Areas of Critical Environmental Concern (ACEC); a loss of 16.3 acres of priority habitat for three state-listed species; and a loss of 4.5 acres of Article 97 public open space), coupled with the lowest air quality benefits (a 9.3 kg/day reduction in volatile organic compounds

[VOCs] and a 6,588 tons/year reduction in carbon dioxide [CO_2]), resulting in a greater overall environmental impact.

In response to the comments received on the DEIS/DEIR the Rapid Bus Alternative was re-evaluated and modified as described below.

3.1.5.3 Modified Rapid Bus Alternative

To address the concerns summarized above and make the Rapid Bus Alternative more competitive with rail and increase its ridership several operational and infrastructure improvements to the Rapid Bus Alternative were identified. These improvements were designed to reduce travel times, increase reliability, and connectivity of the Rapid Bus Alternative by:

- Eliminating bottlenecks associated with the Zipper Lane;
- Improving connection to Back Bay employment area by directly routing some service; and
- Providing additional Rapid Bus Alternative stations in the vicinity of stations proposed for the commuter rail alternative, specifically the Raynham and Easton areas.

Multiple alternatives were developed and evaluated based on the criteria established in the DEIS/DEIR. The changes that were selected and became part of the Modified Rapid Bus Alternative are described in detail in Appendix 3.1-E: *Modified Rapid Bus Alternative Technical Memorandum*.

In developing the Modified Rapid Bus Alternative several major constraints and concerns were identified:

- A fully exclusive bus lane (to reduce travel time) could not be feasibly constructed all the way into Boston;
- Because the Modified Rapid Bus Alternative requires using a section of the existing highway system that is already subject to heavy congestion and is vulnerable to significant delays, the reliability of the Modified Rapid Bus Alternative would be severely impacted, which would negatively affect ridership;
- While capital costs would be lower, the operating and maintenance costs of the Modified Rapid Bus Alternative would be more than double those of the Stoughton Electric Alternative, while the Modified Rapid Bus Alternative would have substantially lower ridership than the Stoughton Electric Alternative. This would result in a cost per boarding of the Modified Rapid Bus Alternative almost twice that of the Stoughton Electric Alternative; and
- The Modified Rapid Bus Alternative would have twice as much wetland impact (in area) as the DEIS/DEIR Stoughton Electric Alternative and approximately 30 percent less air quality benefit based on a reduction of annual CO_2 emissions.

In sum, the Modified Rapid Bus Alternative would still have substantially lower ridership, much higher cost and greater adverse environmental impact compared to the commuter rail alternatives.

The Federal Highway Administration (FHWA) provided its review of the DEIS/DEIR Rapid Bus Alternative and subsequent related information (including the Modified Rapid Bus Alternative).[11] The role of the FHWA as a cooperating agency on the EIS for the South Coast Rail project is to provide special expertise and technical assistance with respect to issues concerning the transportation system.

The FHWA, if it were expected to have an approval action on the selected alternative, would need to comply with NEPA for its action, and as a cooperating agency in the current NEPA review FHWA could adopt the environmental document that is prepared for the project in compliance with NEPA. Its review of the Modified Rapid Bus Alternative therefore examined the alternative from the perspective of both responsibilities as cooperating agency for the Corps NEPA review and as a potential decision-maker for such an alternative. The Rapid Bus Alternative would use a segment of the National Highway System, which includes the Interstate System in which the FHWA also has a special interest: FHWA's Policy on Access to the Interstate System reflects Congressional intent and direction provided in transportation legislation, reiterates FHWA's responsibility to preserve and enhance the Interstate System, and meets the needs of the 21st Century by assuring that the Interstate System provides the highest level of service in terms of safety and mobility.

The FHWA commented that "Based on the information provided in the DEIS and related materials, it is our opinion that the analysis of the Rapid Bus Alternative accurately presents the impacts to the transportation corridor and the region. Furthermore, FHWA believes that the impacts to the roadway network, in particular those which degrade service on the Interstate System associated with the Rapid Bus Alternative and its various modifications are unacceptable, and thus the alternative is not a viable option"

In sum, the substantial analysis conducted for the Rapid Bus Alternative during the DEIS/DEIR and subsequent consideration of optimized Modified Rapid Bus Alternatives (see Appendix 3.1-E), including its multiple design variations, indicates very low ridership, fewer regional mobility benefits (interregional links), greater impact on the environment and on the transportation system than the rail alternatives and high cost of the (Modified) Rapid Bus Alternative and its variants. The Corps has thoroughly considered this data and the determination by the FHWA (in its capacity as a Cooperating Agency with technical expertise on this alternative) of this alternative as non-viable. The Corps concludes that, at best, the Modified Rapid Bus Alternative (1) meets the overall project purpose only marginally by generating approximately 1/3 fewer riders than MassDOT's preferred alternative, (2) is unreasonably costly to construct and maintain (more than double the annual operating and maintenance cost of the Stoughton Electric Alternative), and (3) is logistically infeasible to construct in a manner that would not be highly likely to eventually degrade the already stressed Interstate Highway transportation system. Accordingly, the Corps has determined that the Modified Rapid Bus Alternative is not practicable, after taking into consideration cost, existing technology and logistics in light of overall project purposes (40 CFR 230.10(a)(2)), and therefore, the alternative was eliminated from further consideration in the FEIS/FEIR.

3.2 DESCRIPTION OF ALTERNATIVES EVALUATED IN THE FEIS/FEIR

This section provides a description of the alternatives evaluated in the FEIS/FEIR: the No-Build (Enhanced Bus) Alternative (which does not meet the purpose and need for the project, but serves as a

[11] Letter from FHWA to USACE re: South Coast Rail Project. January 17, 2013.

baseline for the analysis of the Build Alternatives), the Stoughton Alternative (electric and diesel variants) and the Whittenton Alternative (electric and diesel variants).

Consistent with the Secretary's Certificate on the DEIR, MassDOT advanced the design of the Stoughton Electric Alternative. This included a more accurate estimate of project impacts, constructability, mitigation measures, and costs. The operating plan has also been refined to optimize travel times and reduce conflicts with freight service. Specific alterations to the DEIS/DEIR alternative design are identified in each specific section.

Subsequent to the publication of the DEIS/DEIR, the Corps requested MassDOT to provide additional data such that the Corps could further evaluate alternatives in the FEIS/FEIR. The Corps did not disagree with any of the items contained in the Secretary's certificate on the FEIR; however the Corps noted that additional data was necessary to ensure that options other than the Stoughton Electric Alternative were addressed. Accordingly, the Corps required additional information concerning the Rapid Bus (discussed above) and Whittenton Alternatives, and also required additional data concerning cultural resource impacts to ensure that (1) all practicable alternatives would be fully analyzed in the FEIS/FEIR, and (2) due consideration would be given to the potential effects of the alternatives on cultural resources as well as other environmental considerations.

This section includes information on the engineering design of the track infrastructure, bridges, stations, and layover facilities associated with the Stoughton and Whittenton Alternatives. It also includes an updated operations analysis in Section 3.2.8.2. Section 3.2.19 provides information on construction of each of the project elements. Additional information on the feeder bus system, grade crossings, bridges, and the layover facility site selection is presented in the appendices 3.2-A and 3.2-E to this FEIS/FEIR.

3.2.1 Overview of Build Alternatives Corridors

The following sections describe the rail corridors within which the proposed Build Alternatives would be constructed. Aspects discussed include corridor location, current conditions, constraints, issues, and ownership.

This section describes those transportation corridors associated with the Stoughton, and Whittenton (electric and diesel) rail options. The organization of the description of these corridors forms the basis for the characterization of the affected environment and environmental consequences of the rail alternatives in Chapter 4.

3.2.1.1 The "Southern Triangle"

This section, common to all rail alternatives, provides an overview of two components of the transportation system south of Weir Junction, referred to as the "Southern Triangle." These components include the New Bedford Main Line and the Fall River Secondary.

New Bedford Main Line Rail Segment

The New Bedford Main Line is an active rail line running from the Attleboro Secondary at Weir Junction in Taunton to the waterfront piers in New Bedford. The line connects with the Middleborough Secondary at Cotley Junction and the Fall River Secondary at Myricks Junction. The line is in service for freight only at the present time. The line is mostly single track (but was constructed to carry two tracks), with a two-track section north of Cotley Junction. The line was acquired from CSX by MassDOT.

The line passes through some environmentally sensitive areas, including Assonet Cedar Swamp in Berkley and Lakeville and is adjacent to Acushnet Cedar Swamp State Reservation in New Bedford. Other constraints include dense development along the line in New Bedford.

Fall River Secondary Rail Segment

The Fall River Secondary is an active rail line running between the New Bedford Main Line at Myricks Junction in Berkley and the waterfront in Fall River. The line is in service for freight only at the present time. The line is all single-track, and was acquired by MassDOT from CSX.

The line passes through some environmentally sensitive areas, including Assonet Cedar Swamp in Berkley. Other constraints include dense development along the line in Fall River, and large slopes above and below the line in Fall River along the Taunton River.

3.2.1.2 Northeast Corridor Rail Segment

The Northeast Corridor is an active rail line running between New York City and South Station in Boston. The portion of interest for this project runs from Attleboro to Boston. The corridor experiences heavy use, including Amtrak Regional and Acela service, MBTA commuter rail service, and freight rail service. The MBTA Providence Line uses the entire length of this portion of the corridor; the Stoughton Line, Franklin Line, and Needham Lines join farther north at Canton Junction, Readville, and Forest Hills, respectively.

The corridor has at least two tracks on this section, with three tracks from Readville to Boston. There are also two station siding tracks at Attleboro Station. The corridor is electrified, meaning that both diesel and electric trains can operate, and is designed and signaled for high-speed rail operations. The corridor is owned by the MBTA. Train operations are controlled by Amtrak. In general, the majority of the Northeast Corridor north of Canton Junction is highly developed and lacks environmentally sensitive areas.

3.2.1.3 Attleboro Secondary Rail Segment

The Attleboro Secondary is an active rail line running from the Northeast Corridor in Attleboro to the Stoughton Line and New Bedford Main Line at Weir Junction in Taunton. The line is in service for freight only at the present time. The line is mostly single track, with a two-track section just east of the Northeast Corridor in Attleboro. The line is currently owned by MassDOT and operated by CSX.

The line runs through some environmentally sensitive areas, including Chartley Pond and the Three Mile River ACEC. It also has many grade crossings in downtown Taunton, because it runs directly through the densely developed core of the city.

3.2.1.4 Stoughton Alternatives Corridor

This section provides an overview of the Stoughton Main Line, the main component of the transportation corridor for the Stoughton Alternatives under consideration. Alternatives through Stoughton would also use the Northeast Corridor north of Canton Junction (for a description of the Northeast Corridor, see Section 3.2.1.2).

The Stoughton Main Line is a rail line running from the Northeast Corridor at Canton Junction to the Attleboro Secondary and New Bedford Main Line at Weir Junction in Taunton. The line is active between Canton Junction and Stoughton Station serving commuter rail on the MBTA Stoughton Line and freight

rail to customers in Canton and Stoughton. A short piece of the line north of Weir Junction is active, serving freight only. Service along the remainder of the line, from Stoughton Station to Raynham Junction was discontinued in 1958, and the segment between Raynham Junction and Taunton, has been abandoned since approximately 1916. Tracks have been removed between Longmeadow Road, Taunton and Short Street, Easton.

The active sections of the corridor are single-track, except at the approach to Canton Junction, where there are two tracks. The corridor is owned by the MBTA, north of Britton Street in Raynham. Parts of the right-of-way north of Longmeadow Road in Taunton were sold and are today in various public/private ownership. The active rail segment north of Weir Junction is owned by MassDOT and operated by the MassCoastal Railroad.

The corridor runs through some environmentally sensitive areas, including Pine Swamp in Raynham and the Hockomock Swamp ACEC in Easton. Hockomock Swamp is one of the most important wetlands in the state for rare species habitat and protects regional water quality.

3.2.1.5 Whittenton Alternatives Corridor

This section provides an overview of the main component of the transportation corridor for the Whittenton Alternatives under consideration. Like the Stoughton Alternatives, the Whittenton Alternatives would use the Northeast Corridor north of Canton Junction to the Stoughton Main Line to the Whittenton Branch. The Whittenton Branch is an abandoned rail line in Raynham and Taunton, running around the northwest edge of the core of the City of Taunton and connecting the Stoughton Line with the Attleboro Secondary.

The corridor runs through the Hockomock Swamp ACEC in Easton but would avoid impacts to Pine Swamp in Raynham. The Whittenton Branch is currently owned by the MBTA.

The Whittenton Alternative represents the corridor that was last used to carry passenger trains between South Station and New Bedford. Use of the Whittenton line by rail ceased as passenger service was discontinued in 1958.

3.2.2 Description of Build Alternative Modes

The following sections describe the modes used by the FEIS/FEIR alternatives and the operating assumptions used to evaluate each mode.

3.2.2.1 Diesel Commuter Rail

Diesel commuter rail refers to a fixed-guideway system with steel wheels operating on steel rails, with one or two locomotives pulling a number of passenger coaches; on the MBTA system, train sets are generally six to nine coaches. Coaches would be bi-level, to increase capacity. Figures 3.2-1 and 3.2-2 depict a typical cross-section of a conventional commuter rail.

Diesel commuter rail maximum speed was assumed to be 79 mph, the maximum currently operated on the MBTA system. For

purposes of comparing alternatives, headways[12] for commuter rail alternatives were set at 30 minutes on the branches (Fall River Secondary and New Bedford Mainline) and 18 minutes on the trunk, during the peak period in the peak direction. Scheduled travel times on existing services were not altered.

3.2.2.2 Electric Commuter Rail

Electrified commuter rail refers to a fixed-guideway system with steel wheels operating on steel rails, with one or two locomotives pulling a number of passenger coaches. For consistency with the MBTA system, train sets are assumed to be six to nine coaches. Coaches would be bi-level to increase capacity. Electrified commuter rail locomotives are powered by an overhead electrical contact system. Figures 3.2-3 through 3.2-5 depict a typical cross-section of an electrified commuter rail.

For electric commuter rail, the maximum speed was assumed to be 100 mph, the maximum speed that can be operated without incurring significant signal costs because of the need to signal civil restrictions. For purposes of comparing alternatives, headways for electric commuter rail alternatives were set at 30 minutes on the branches and 18 minutes on the trunk, during the peak period in the peak direction.

3.2.3 No-Build Alternative – Enhanced Bus

The No-Build Alternative is described here in further detail to respond to the Secretary's Certificate. Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts; however, existing bus routes would be enhanced. The No-Build Alternative would improve transit service to Boston from New Bedford, Fall River, and Taunton by adding more buses with smaller capital investments than are proposed in the Build (i.e., Stoughton and Whittenton) Alternatives.

The South Coast Rail study area includes commuter rail and bus service and associated infrastructure such as commuter rail stations and park-and-ride lots. Also included in the No-Build Alternative is the reconstruction of existing railroad bridges, already underway in New Bedford. This reconstruction addresses existing maintenance needs to ensure safe operation of active freight trains currently using the New Bedford Main Line. The analysis of the No-Build Alternative also assumes the expansion of South Station and the construction of a new mid-day facility in Boston, as currently proposed by MassDOT to better meet existing passenger rail needs (see below). These improvements would be implemented irrespective of the South Coast Rail alternatives.

3.2.3.1 No-Build Commuter Rail Service

No commuter rail service is offered within the South Coast area. Although commuter rail service is offered in nearby southeastern Massachusetts communities by the MBTA, this service is difficult for most residents to access and is approaching or over capacity under existing conditions, as shown in Table 3.2-1.

[12] The interval of time between two trains boarded by the same unit at the same point. Dictionary of Military and Associated Terms. US Department of Defense 2005.

The Attleboro/Providence Line has stations in Providence, South Attleboro, Attleboro, Mansfield, and Sharon. The Stoughton Line has stations in Stoughton, Canton Center and Canton Junction and the Middleborough Line has stations in Brockton, Bridgewater, and Middleborough/Lakeville. Several communities located on the fringes of the South Coast area, including Easton, Raynham, Norton, and Lakeville, are near existing commuter rail stations.

Communities in the heart of the South Coast area, however, are outside a 6-mile access radius of these stations, and some are more than 20 miles from the nearest commuter rail station.[13] Commuter rail is currently not a reasonable alternative for most South Coast area residents traveling to Boston, especially from the communities of Taunton, Berkley, Freetown, Fall River, New Bedford, Dartmouth, and Westport due to the distance from the nearest station.

Table 3.2-1 Ridership on Providence, Stoughton and Middleborough Rail Lines

Line	AM Peak Passengers	AM Peak Seating Capacity	AM Peak Utilization*
Providence	11,017	8,532	129%
Stoughton	2,771	3,558	78%
Middleborough	3,743	3,696	101%

Source MBCR Ride Check December 2006, MBTA South Side Equipment Schedule
* Assumes all passengers continue to South Station, Stoughton, Providence/Stoughton and Middleborough/Lakeville Lines.

While residents from Lakeville are able to use commuter rail to commute to Boston, system capacity is limited. Commuter rail station parking lots in Attleboro, Mansfield, Stoughton, and on the Middleborough Line are either currently unable or will soon not be able to handle any more growth, and communities are reluctant to increase parking lot capacity. In addition, some peak hour trains experience heavy passenger loads. Therefore, the existing commuter rail service, although within reach of some communities in the South Coast area, is not sufficient to handle the current demand and anticipated growth in ridership.

3.2.3.2 No-Build Commuter Bus Service

Existing commuter bus service to Boston from New Bedford, Fall River, and Taunton is currently provided by three commuter bus carriers: DATTCO provides Boston-New Bedford service; Peter Pan provides Boston- Fall River bus service; and Bloom provides Boston-Taunton service. Figure 3.2-6 shows these routes.

These bus companies offer a fare structure that is competitive to commuter rail service. The three commuter bus routes travel through the downtown core of New Bedford, Taunton, and Fall River. The routes all board passengers in the downtown before traveling to other locations to pickup/drop-off passengers at external bus stops/park-and-ride lots and intermediate flag stops. The Fall River commuter bus runs express to Boston with no intermediate stops.

In addition to the private commuter bus service to Boston, two regional transit authorities (RTAs) provide transit service in the study corridor: SRTA operates in New Bedford and Fall River sub-region, and GATRA operates in the Taunton/Attleboro area sub-region. Each RTA shares terminal facilities with commuter bus companies. These authorities share infrastructure and terminals with the commuter bus

[13] According to CTPS, most commuter rail riders live within 6- to 8-miles of a commuter rail station. This distance is generally used for estimating ridership.

carriers and provide passengers an intermodal link from other points within the local communities to the Boston commuter bus service.

South Coast Regional Bus Service

SRTA serves the communities of New Bedford, Fall River, and Somerset with fixed route and demand responsive services. SRTA operates 10 routes in the New Bedford area, 11 routes in the Fall River area, and one route between New Bedford and Fall River. SRTA has downtown terminal stations, both in Fall River and New Bedford, where the commuters could transfer directly to the commuter buses to Boston. New Bedford weekday service generally begins between 5:30 and 6:30 AM and ends roughly between 6:30 and 7:30 PM. Fall River weekday service begins between 6:00 and 7:00 AM and ends between 5:30 and 6:30 PM. SRTA operates on Saturday from 7:00 AM to 6:00 PM in New Bedford and from 6:30 AM to 7:00 PM in Fall River. There is no Sunday bus service in either New Bedford or Fall River.

GATRA primarily serves the communities of Attleboro and Taunton with fixed route bus service and demand responsive service. GATRA operates 14 fixed routes and two intercity routes. GATRA has a terminal station on Oak Street in Taunton where commuters could transfer directly to commuter buses to Boston. The various GATRA bus routes operate Monday through Friday beginning between 5:30 and 6:30 AM and ending between 6:00 and 7:00 PM. GATRA Saturday bus service begins at 9:00 AM and ends at 5:00 PM. There is no Sunday bus service.

New Bedford to Boston Bus Service

New Bedford to Boston commute originates in Fairhaven at the bus terminal and maintenance facility at 72 Sycamore Street. This service has three intermediate stops along the route to Boston: SRTA Terminal in downtown New Bedford, Mt. Pleasant Street park-and-ride in New Bedford, and Silver City Galleria park-and-ride in Taunton. The SRTA terminal in downtown New Bedford is the main station stop that provides service to the SRTA fixed route bus service and provides covered terminal area for loading and unloading passengers for SRTA and DATTCO buses. The terminal is located in Downtown New Bedford at the corner of Elm Street and Pleasant Street. There is covered parking above the terminal for approximately 80 cars, but is allowed by permit only and is at capacity. These spaces are primarily used by employees who work in the downtown area.[14] Commuters to Boston use the Elm Street Garage nearby or travel north to the Mt. Pleasant Street park-and-ride for all-day parking. The commuter bus terminates and originates service from South Station Bus Terminal in Boston. Figure 3.2-6 depicts the New Bedford bus route to Boston.

There is a small terminal area at the Fairhaven location that DATTCO uses to provide bus storage, maintenance, office space, and a waiting area for up to two buses. There are 28 striped parking spaces in the surface lot adjacent to the bus waiting area for commuters. Additional passengers are also likely to be dropped-off/picked-up and walk or bike to the terminal from the local neighborhoods.

SRTA's FY 2009-2012 Transportation Improvement Program (TIP) includes funds for renovations to the terminals and garages.

New Bedford to Boston Bus Operations—The weekday schedule for the bus from New Bedford to Boston includes 11 trips inbound and 11 trips outbound. The weekday inbound morning commute operates five trips on half-hour headways from 4:50 AM to 6:50 AM and then 120-minute headways for the remaining inbound trips. The weekday outbound evening commute operates five trips on various

[14] Based on discussion with SRTA administration.

headways beginning with a 45-minute headway at 4:00 PM, and then half-hour headways, followed by one 60-minute headway with the last peak trip leaving at 6:45 PM. One final outbound trip departs at 9:00 PM. Weekend service includes four trips inbound and four trips outbound stopping at the same stops served during weekday service. The inbound service begins at 6:50 AM and operates on four-hour headways until 6:50 PM. The outbound service begins at 9:00 AM and also operates on four hour headways until 9:00 PM.

Based on the schedule, travel times inbound range from 120 minutes in the peak period to 95 minutes in off peak periods. Travel times outbound range from 100 minutes during peak period to 85 minutes during the off peak period.

Fall River to Boston Bus Service

The Fall River commuter bus service to Boston is an express service from downtown Fall River at the corner of Third Street and Borden Street to South Station Bus Terminal in Boston. The service originates in Newport, Rhode Island and then travels to the temporary trailer bus terminal located on Borden Street in Fall River. This temporary terminal serves both SRTA and Peter Pan buses and provides for ticketing purchases within the trailer bus terminal building. A new bus terminal is planned near or at the location of the current terminal. Figure 3.2-6 depicts the Fall River bus route to Boston.

The SRTA FY 2009 TIP includes plans to replace the SRTA bus terminal in Fall River (razed for the construction of the Fall River Courthouse). SRTA also plans continual renovations to the terminals and garages listed in the fiscal year 2009-2012 TIP.

Fall River to Boston Bus Operations—The weekday schedule for the bus from Fall River to Boston is more limited than that of New Bedford, offering six trips inbound and six trips outbound. The weekday inbound morning commute operates three trips with the first departing at 6:00 AM and then the next on a 40-minute headway and the next on a 120-minute headway. The weekday outbound evening commute operates three trips on 60-minute headways beginning at 4:30 PM. Weekend service is the same schedule as weekday except the 6:00 AM and 6:40 AM buses are eliminated inbound and the 5:30 PM and 6:30 PM are eliminated outbound.

Based on the bus schedule, travel times for the Fall River bus route vary from 85 minutes during peak periods to 60 minutes during off -peak periods.

Taunton to Boston Bus Service

The Taunton to Boston commuter bus service originates in Taunton at the GATRA/Bloom bus terminal and maintenance facility on Oak Street. The service has two official stops along the route to Boston: Raynham/Taunton Greyhound Track park-and-ride lot on Route 138 in Raynham and Route 106 near Route 24 overpass park-and-ride lot in West Bridgewater. Other flag stops are offered at the Friendly's restaurant on Route 138 and at the corner of Route 138/Route 106 in Easton. If requested, the inbound trip will stop at the Westgate Mall in Brockton. Based on requests for stops, the outbound trip includes up to four stops at the Westgate Mall throughout the day as needed.

Taunton to Boston service differs from the Fall River and New Bedford services as it does not use South Station Bus Terminal. The Taunton service has street rights to drop-off/pick-up passengers on street at Park Square at 212 Stuart Street and near South Station at the corner of Lincoln Street/Kneeland Street inbound, and at the corner of Lincoln Street/Beach Street, outbound. Figure 3.2-6 depicts the Taunton bus route to Boston.

The Taunton bus terminal has recently been upgraded with a new paved parking lot, new lot striping, and new lighting. There was also a new pedestrian walkway added down the center of the lot to link to the Oak Street sidewalks and emphasize pedestrian activity and multi-modal shared space at the terminal. The terminal parking lot has a capacity of 158 parking spaces, of which five are designated as handicapped parking.

GATRA has plans for terminal improvements identified in the fiscal year 2009-2012 TIP. The TIP does not indicate the nature or extent of the planned terminal improvements.

Taunton to Boston Bus Operations—The weekday schedule for the bus from Taunton to Boston provides 15 trips inbound and 14 trips outbound to Boston. The weekday inbound morning commute operates seven trips from 5:30 AM to 9:00 AM. The first five trips are on half-hour headways and the final two on 45-minute headways. The weekday outbound evening commute operates six trips from 3:35 PM to 7:05 PM. on various headways beginning with 45-minute headways, a 25-minute headway during peak period, back to a 45-minute headway and ending outbound service with 60-minute headways to the final bus at 7:05 PM.

Weekend commuter bus service is limited to two trips inbound and two trips outbound. During weekend service there is a 9:00 AM and 3:45 PM inbound trip and 9:50 AM and 4:55 PM outbound trip.

Based on the published schedule, travel times inbound range from 90 minutes during the peak periods to 60 minutes during the off- peak periods. Travel times outbound are consistent with times approximately 70 minutes throughout the day.

Commuter Park-and-Ride Lots for Bus Service from South Coast to Boston

Park-and-ride lots are located throughout the southeastern Massachusetts sub-region from Wareham to Attleboro. The following are the primary park-and-ride locations for buses to Boston, based on the MassHighway database and research of the study area:

- Route 106 near Route 24 – West Bridgewater, Massachusetts
- Route 24 Exit 12 – Silver City Galleria- Taunton, Massachusetts
- Oak Street Bloom/GATRA Terminal – Taunton, Massachusetts
- I-495 Exit 8 – Route 138/Greyhound Track – Raynham, Massachusetts
- Mt. Pleasant Street – New Bedford, Massachusetts
- 72 Sycamore Street – Fairhaven, Massachusetts

Figure 4.1-1 depicts the major park-and-ride locations in southeastern Massachusetts. The following section describes each park-and-ride location and existing capacity for each lot.

Route 106 near Route 24 – West Bridgewater Park-and-Ride Lot

This parking lot is located on the southwest corner of the Route 24/Route 106 interchange in West Bridgewater. The lot has a capacity of 140 vehicles and is in high demand during all times of the year. During recent parking surveys at this lot, many vehicles are illegally parked with overflow parking

exceeding capacity by five to 15 vehicles. Commuters can park here free and take the Bloom Bus to Boston. Bloom Bus drops-off/picks-up passengers at the corner of Pleasant Street and the southwest corner of the park-and-ride lot. The bus cannot circulate through the narrow parking lot so it stops just outside the lot at this location. Bus shelters are not provided at this lot. There are MassDOT plans to expand the park-and-ride lot by 40 parking spaces within the next five years.

Route 24 Exit 12 – Silver City Galleria – Taunton Park-and-Ride Lot

This parking lot is located within the main Silver City Galleria mall parking area as a separate small parking lot. The parking lot is designed as several rows of parking with a parking capacity for 187 vehicles that is near capacity in summer months based on field observations conducted in summer 2008.

The New Bedford bus serves this parking lot for the commute to Boston. Commuters can park here for free and take the New Bedford bus to Boston. The parking lot is designed so that buses can circulate the parking lot to pick-up/drop-off passengers. One small bus shelter is provided at the rear of the lot.

During a survey completed in October 2008 another new park-and-ride area was identified near the existing lot. This 24-space parking lot is located within the main mall parking area across the street from the main park-and-ride lot. It was signed and striped with red paint for park-and-ride use and was observed at full capacity during the survey.

Oak Street Bloom/GATRA Bus Terminal – Taunton Park-and-Ride Lot

This parking lot is attached to the Taunton bus terminal located on Oak Street in downtown Taunton, Massachusetts. The lot has a capacity of 158 parking spaces including five designated for handicapped commuters. Commuters can park here for free and take the Taunton bus to Boston. Based on historic parking utilization counts, the lot is underutilized with excess capacity during the typical weekday. Commuters board the buses via the rear of the terminal building at the bus bay. The terminal provides a ticket booth, café, and waiting area for passengers. Retail space is available for additional businesses.

Route 138 – Raynham/Taunton Greyhound Track – Raynham Park-and-Ride Lot

This parking lot is a small section of the overall Greyhound Track parking lot that has been designated for park-and-ride usage. There is no parking lot striping delineating the number of parking spaces. Based on data provided in the 2007 Southeastern Regional Planning Regional Transportation Plan, the capacity of this lot is 150 spaces. In June 2008 this lot was underutilized and partially being used for storage of telephone poles so the actual capacity may be less. There is one glass enclosed bus shelter at this park-and-ride.

Mount Pleasant Street – New Bedford Park-and-Ride Lot

This parking lot is a large surface lot with several rows of parking located off Mt. Pleasant Street, north of King's Highway in New Bedford. Based on a field visit to the site the lot has a capacity of 201 spaces, with five designated as handicapped parking. The lot is approaching capacity although there were a number of spaces available to the rear of the lot. The buses can access the parking lot easily and pick-up passengers at the two internal bus shelters. A field visit revealed illegal dumping occurring at the back of the site and drainage issues with large standing water occupying five parking spaces in the southeast corner of the parking lot. Due to the site design and depth of the parking lot from the street, there is concern about safety and security and a lack of adequate lighting.

72 Sycamore Street, DATTCO Bus Terminal – Fairhaven Park-and-Ride Lot

This parking lot is a small surface lot adjacent to the terminal. The lot has a capacity of 28 vehicles. Based on MassHighway data, this location has up to 80 spaces available. However, based on discussions with DATTCO these additional spaces are located in the fenced area located adjacent to the main terminal building and are no longer available due to safety and security concerns and should not be included in the total available parking. Based on recent parking surveys, there were available spaces to park in this small lot. Bus shelters are not provided at this lot but there is a covered overhang attached to the terminal that is used as a waiting area.

Bus Schedule Enhancements

Bus service plan and schedule enhancements are an essential part of improving commuter bus service to the South Coast study area. The current bus schedules from Taunton and New Bedford offer good service for the most part with reasonable headways based on their current schedules. The Fall River service requires schedule improvements to provide more inbound and outbound options that would offer shorter headways and enhanced commuter flexibility on arrival and departure times. The following sections summarize possible enhancements to the existing services.

Fall River Bus Service

The current Peter Pan commuter bus service for the Fall River to Boston commute is limited, with six inbound and six outbound trips. To offer better service and shorter headways, it is recommended that 30-minute headways be added to the schedule to enhance ridership during inbound and outbound peak periods to offer more flexible service for the Fall River commuters. During travel time surveys some Fall River commuters using the Taunton bus service (Bloom) indicated that the infrequent Peter Pan service is the reason they commuted via the Taunton bus service. The current schedule does not provide Fall River commuters with a flexible schedule and discourages ridership.

New Bedford Bus Service

The New Bedford commuter bus service (DATTCO) uses five buses constantly running throughout the day and provides 11 inbound trips and 11 outbound trips to South Station Bus Terminal. The service for the Boston commute offers a schedule similar to the Taunton service plan, although less extensive. There are 30-minute headways in the peak period direction. To enhance service, it is recommended that 30-minute bus headways for the evening commute begin at 4:00 PM and continue to 6:00 PM. This would require a minor adjustment to the existing schedule by including an additional bus for the evening commute. This schedule would offer more frequent service and shorter headways and provide more flexible service for New Bedford commuters.

Taunton Bus Service

The Taunton commuter bus service (Bloom) is extensive with 15 inbound trips and 14 outbound trips daily. This schedule provides 30-minute headways during the morning and evening peak period commuter times and is adequate for current demands. The addition of more buses for 15-minute headways during the peak period is not warranted at this time based on current ridership demands.

Park-and-Ride Lot Expansion/Bus Stations

The No-Build Alternative does not include any new or expanded park-and-ride lots or bus stations, and therefore the environmental impacts of any such expansions are not addressed in this FEIS/FEIR. Nevertheless, to be responsive to comments on the DEIS/DEIR requesting more information on the No-Build Alternative transportation conditions, information on locations potentially warranting expanded or new park-and-ride/bus station facilities are discussed below.

Based on parking utilization counts completed at the Silver City Galleria park-and-ride lot in Taunton in summer 2008, the existing lot is at capacity. During an October 2008 parking survey, additional parking was observed to have been established and was also filled to capacity. There are existing paved parking lots nearby that appear to be vacant. These lots could be used for a potential new expanded park-and-ride/bus station, or other sites could be identified in the immediate area around the Silver City Galleria and the Route 24/Route 140 highway interchange. A new facility at or near the mall could easily integrate local fixed route GATRA bus service which already serves the mall throughout the day. This linkage to local fixed route bus service could also encourage ridership on commuter bus.

Based on a review of available information and parking occupancy studies, a bus station/park-and-ride facility in the Bridgewater/West Bridgewater area, near the existing Route 106/Route 24 park-and-ride lot, would be readily utilized. A bus station and park-and-ride could be combined into one potential intermodal station near the existing park-and-ride lot. Both the existing park-and-ride lots at Route 106 (West Bridgewater) and Route 104 (Bridgewater) are operating at capacity. These two lots also do not allow buses to enter or exit the lots to pick-up or drop-off commuters. Although plans are underway to provide 40 more spaces at the West Bridgewater park-and-ride, a new park-and-ride/bus station could provide full bus access /egress and larger park-and-ride facilities. This might capture additional riders for all three commuter bus services that travel by this location via Route 24.

Based on review of available parking utilization studies for the Mt. Pleasant Street park-and-ride lot in New Bedford, this lot is operating at 80 percent of capacity. If future ridership projections for the area indicate a significant increase in ridership for this region, an expanded park-and-ride/bus station may have merit in the existing lot, on adjacent land, or at another suitable location in the general area.

Joint Ticketing System Bus/Rail

The commuter rail monthly fare provides a free ride on the MBTA bus or rapid transit for those commuters that purchase monthly passes. This service is a significant advantage to commuter rail versus private commuter bus, as the bus companies do not offer this benefit, making bus travel less attractive to commuters.

SRPEDD and the commuter bus operators have advocated for transportation policymakers to address the transit fare inequity between modes with a joint ticketing system allowing the bus operators to offer the same pass as commuter rail with free access to MBTA bus and rapid transit. A joint ticket for commuter bus would enhance bus service to the region.

3.2.3.3 South Station Expansion Project

One of the rail improvements anticipated to be undertaken under No-Build condition is the expansion of South Station. MassDOT, with funding from the Federal Railroad Administration (FRA), is undertaking a project to evaluate the expansion of Boston’s South Station. The South Station Expansion project includes planning, NEPA/MEPA reviews, and preliminary engineering. The South Station Expansion

project is being undertaken to allow for expansion of intercity and high-speed rail (HSR) service into Boston's South Station, and to improve existing rail operations and service delivery at South Station provided by the National Railroad Passenger Corporation (Amtrak) and the MBTA.[15] The key elements of the South Station Expansion Project include:

- Expand the South Station terminal facilities, including the addition of up to seven tracks and platforms and construction of a new passenger concourse and other amenities.
- Acquire and demolish the U.S. Postal Service (USPS) General Mail Facility located on Dorchester.
- Avenue adjacent to South Station, which will provide an approximate 16-acre site onto which to expand South Station.
- Create an extension of the Harborwalk along reopened Dorchester Avenue.
- Provide for the possibility of future joint/private development adjacent to and over an expanded South Station.
- Provide adequate rail layover space to address existing and future intercity and commuter rail service needs. Currently, there are not sufficient train layover facilities to meet existing South Station operational requirements, resulting in restrictive scheduling of revenue and non-revenue trains in and out of South Station. To accommodate existing needs and to facilitate future Amtrak and MBTA service expansions and other planned improvements, additional layover space is required. The three sites currently under consideration are the Boston Transportation Department-owned Tow Lot, Beacon Park Yard, and Readville-Yard 2.

As described in the South Station Expansion ENF and federal funding application, the increase in South Station capacity and the midday layover facility is needed for both existing and future operations of both Amtrak and MBTA. Expansion of South Station has independent utility (40 CFR 1508.25(a)) from the South Coast Rail project because, while it would be required to accommodate any of the commuter rail alternatives of the South Coast Rail project, the need for expansion of South Station capacity exists without the South Coast Rail project and the expansion of South Station would be constructed absent the construction of other projects in the project area. The expansion of South Station will be subject to its own environmental review process, which is ongoing. The South Station Expansion DEIR is anticipated in summer 2014.

3.2.4 Stoughton Electric Alternative

The Stoughton Electric Alternative would provide commuter rail service to South Station using the Northeast Corridor (NEC), Stoughton Line, New Bedford Main Line, and Fall River Secondary. The New Bedford route would be 55.0 miles long and the Fall River route would be 52.7 miles long. Figure 3.2-7 shows the route of the Stoughton Alternative.

The Stoughton Alternative would:

- Utilize 15.5 miles of existing NEC track infrastructure between Boston and Canton Junction (no new track infrastructure would be required along this 15.5-mile length of the NEC);

[15] http://www.massdot.state.ma.us/Portals/25/Docs/efs/EnvironmentalNotificationForm.pdf

- Require improvements to track infrastructure along the Stoughton Line including:
- Reconstructing existing tracks from Canton Junction to Stoughton, as double track, a distance of 3.8 miles; and
- Constructing new tracks on existing right-of-way from Stoughton Station to Longmeadow Road in Taunton, as one to two tracks, a distance of 14.9 miles;
- Require reconstructing track from Longmeadow Road to Weir Junction in Taunton, from one to two tracks, a distance of 1.7 miles;
- Require reconstructing track on the Southern Triangle (common to both the Stoughton and Whittenton Alternatives), including:
- Reconstructing the existing New Bedford Main Line tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction, a distance of 4.9 miles; and single track with three sidings from Myricks Junction to New Bedford, a distance of 14.5 miles; and
- Reconstructing the existing Fall River Secondary tracks from Myricks Junction to Fall River, as single track with four sidings, a distance of 12.3 miles.
- Infrastructure improvements for the Stoughton Alternative also include constructing, reconstructing, or widening 40 bridges and constructing or reconstructing 46 railroad at-grade crossings. A summary of the Stoughton Alternative is provided in Tables 3.2-2 and 3.2-3.

Table 3.2-2 Summary of Alternatives—Track

	Stoughton Alternative			Whittenton Alternative		
Segment	**Length (miles)**	**Number of Tracks**	**Number of Sidings**	**Length (miles)**	**Number of Tracks**	**Number of Sidings**
Canton to Stoughton Station	3.8	2		3.8	2	
Stoughton Station to Weir Junction	16.4	1-2		17.9	1-2	1
Weir Junction to Myricks Junction	4.9	2-3		4.9	2-3	
Myricks Junction to New Bedford	14.5	1	3	14.5	1	3
Myricks Junction to Fall River	12.3	1	4	12.3	1	4
Total Length (South Station to New Bedford)	55.0			56.6		
Total Length (South Station to Fall River)	52.7			54.3		

Table 3.2-3 Summary of Alternatives—Crossings

Alternatives	Bridges	At-Grade Crossings
Stoughton	40[1]	46[2]
Whittenton	38[1]	53[2]

[1] Does not include existing bridges that would not require reconstruction
[2] Includes private crossings

This alternative would have ten new commuter rail stations (North Easton, Easton Village, Raynham Park, Taunton, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction of two existing commuter rail stations (Canton Center and

Stoughton). This alternative would include two overnight layover facilities, one in New Bedford and one in Fall River.

To support electric locomotives, a traction power system would be built and would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

3.2.5 Stoughton Diesel Alternative

The Stoughton Diesel Alternative would be identical to the Stoughton Electric Alternative with the exception of the electrical facilities, which would not be required for the diesel alternative.

3.2.6 Whittenton Electric Alternative

The Whittenton Alternative would provide commuter rail service to South Station through Stoughton, connecting to the existing Stoughton Line using the Whittenton Branch and a short segment of the Attleboro Secondary through the City of Taunton. Figure 3.2-8 shows the Whittenton Alternative. The New Bedford route would be 56.6 miles long and the Fall River route would be 54.3 miles long.

The Whittenton Alternative would:

- Utilize 15.5 miles of existing NEC track infrastructure between Boston and Canton Junction;
- Require improvements to track infrastructure along the Stoughton Line, including:
    - Reconstructing existing tracks from Canton Junction to Stoughton, as double track, a distance of 3.8 miles; and
    - Constructing new tracks on existing right-of-way from Stoughton to Raynham Junction, as one to two track sections a distance of 11.9 miles;
- Require constructing new single track on existing Whittenton Branch right-of-way from Raynham Junction in Raynham to Whittenton Junction;
- Require reconstructing existing Attleboro Secondary tracks from Whittenton Junction to Weir Junction, as a single track with one siding, a distance of 6.0 miles);
- Require reconstructing track on the Southern Triangle (common to both rail alternatives) including:
    - Reconstructing the existing New Bedford Main Line tracks from Weir Junction to New Bedford, as two to three tracks from Weir Junction to Myricks Junction, a distance of 4.9 miles; and single track with three sidings from Myricks Junction to New Bedford, a distance of 14.5 miles; and
    - Reconstructing the existing Fall River Secondary tracks from Myricks Junction to Fall River, as single track with four sidings, a distance of 12.3 miles.

Infrastructure improvements for the Whittenton Alternative also include constructing, reconstructing, or widening 38 bridges and constructing or reconstructing 53 railroad at-grade crossings. A summary of the Whittenton Alternative is provided in Tables 3.2-2 and 3.2-3.

This alternative would have ten new commuter rail stations (North Easton, Easton Village, Raynham Park, Dana Street, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction of two existing commuter rail stations (Canton Center and Stoughton), as well as expansion of South Station. This alternative would include two overnight layover facilities, one in New Bedford and one in Fall River.

To support electric locomotives, a traction power system would be built and would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

3.2.7 Whittenton Diesel Alternative

The Whittenton Diesel Alternative would be identical to the Whittenton Electric Alternative with the exception of the electrical facilities, which would not be required for the diesel alternative.

3.2.8 Operations of the Rail Alternatives

This section provides a description of the major components of the Stoughton and Whittenton Alternatives. Specific topics addressed are Operations, Track Infrastructure, Grade Crossings, Bridges and Culverts, Signals and Communications, Rolling Stock, Electrification, & Diesel, Stations, Layover Facilities, and Cost.

Operations of the South Coast Rail alternatives were evaluated and modeled to optimize travel times and ridership. Based on this effort, the operating plan was revised to include a zone-express type operating pattern. In the DEIS/DEIR, all trains made all stops from Fall River/New Bedford to South Station. Under the revised operating plan, peak-period trains between New Bedford and Boston would stop at all stations between Whale's Tooth and North Easton, but would skip the Stoughton, Canton Center, and Canton Junction stations. Trains operating between Fall River and Boston during the peak periods would stop at Battleship Cove, Fall River Depot, Freetown, and all stops from North Easton to Boston. Peak period Fall River trains would not stop at Easton Village, Raynham Park, Taunton (Dean Street Station for the Whittenton Alternatives), or Taunton Depot stations. This change in operations results in reduced trip times for both the Fall River and New Bedford trains which is used for the 2035 ridership projections.

The following sections describe the existing operations on the NEC, Stoughton Line, Fall River Secondary, and New Bedford Main Line, as well as the proposed operating plans for both the South Coast Rail alternatives, and the station stopping patterns.

3.2.8.1 Existing Operations

The NEC, Stoughton Line, Attleboro Secondary, Fall River Secondary, and New Bedford Main Line all currently provide some element of freight or passenger service. The following sections describe the existing passenger and freight operations along these alignments. The Whittenton Branch, which would be utilized for the Whittenton Alternative, does not provide any freight or passenger service at this time. Figures 3.2-9 and 3.2-10 show the existing rail transportation system and its ownership.

Northeast Corridor

The MBTA, Amtrak and CSX operate over the NEC within the state of Massachusetts. The MBTA owns the line, but it is dispatched by Amtrak from their South Station Centralized Electric and Traffic Control facility. That facility exchanges data between Metro North Railroad Operations Control Center, the MBTA Operations Control Center, and Amtrak's Penn Station Control facility.

The NEC between Providence and Readville is predominately a two track electrified (25 kV 60 Hz) Class 8 railroad that is authorized at speeds up to 150 mph where civil infrastructure permits. Currently, only Amtrak reaches speeds above 79 mph on this section of the NEC. The MBTA commuter rail currently operates using diesel locomotives (F40s) with speeds up to 79 mph. CSX operates freight service predominately south of Mansfield.

Over the past two decades a multitude of operational studies have been completed reviewing the type, amount, and frequency of service that can be provided in this section of the NEC. All of these studies agree that this is a very congested portion of the NEC and that the addition of high-speed service has reduced the reserve capacity on the NEC. This reduction in reserve capacity is amplified by the great discrepancy in operating speeds between the different types of service on the corridor.

The MBTA operates five commuter lines on the NEC between South Station and the state line. Each line branches off the corridor, with the exception of the Providence Line service which travels the entire NEC in the state of Massachusetts. The MBTA uses diesel locomotives with up to eight bi-level or single level coaches. The MBTA's maximum authorized speed on the NEC is 79 mph and 70 mph off of the NEC where civil infrastructure conditions permit. The five branch lines include the Worcester Line, Needham Line, Franklin Line, Stoughton Line, and Providence Line. The existing (2008) service for these lines is summarized in Table 3.2-4.

Table 3.2-4 Existing (2008) MBTA and Amtrak Rail Operations

Passenger Service	AM Peak	PM Peak	Off Peak NB	Off Peak SB	Total NB Trips	Total SB Trips
Worcester	8	7	15	13	21	20
Needham	5	5	11	11	16	16
Franklin	7	6	12	12	19	18
Stoughton	4	5	9	12	17	17
Providence	8	5	9	14	20	19
Amtrak	1	3	13	14	19	19

Note: Short turn trains counted

Stoughton Line, Attleboro Secondary, Fall River Secondary, New Bedford Main Line

Passenger rail operations dominate existing railroad operations on the Stoughton Line. There is only one existing freight train that typically operates in a window of availability between Stoughton Line passenger services during the off-peak afternoon period.

The existing freight service for the South Coast Region is shared between CSX Transportation (CSX) and the Massachusetts Coastal Railroad (MCRR). CSX operates on the Attleboro Secondary and Middleboro Secondary. MCRR operates on the Fall River Secondary, New Bedford Main Line, a section of the Attleboro Secondary, and on the Stoughton Line in Taunton. CSX operates long haul freight service and

transfers cars with MCRR at Attleboro, Cotley Junction, and Middleborough. CSX dispatches these lines from its Selkirk, New York dispatch center.

3.2.8.2 FEIS/FEIR Proposed Operations

The Stoughton and Whittenton Electric Alternatives have similar operating plans. The plans were developed to meet the current minimum requirements of the MBTA Service Delivery Plan for commuter rail. The infrastructure proposed for each alternative has been designed to support these levels of operation.

Commuter Rail Operations

The proposed operations would have four peak period trains to each of the terminal stations of New Bedford and Fall River. This translates to approximately 30-minute service on both the Fall River Secondary and the New Bedford Main Line, and an 18 minute headway on the trunk (shared) portion of the route north of Myricks Junction. During the off-peak periods, six additional trains would operate on a 3 hour frequency from the terminal stations and 90 minutes on the trunk portion. This provides 10 round trip trains per weekday from each terminal station.

Both commuter rail alternatives would use the same station stops south of Taunton Depot. By employing a zone-express service pattern (where trains stop at a few stations and then run express), travel times for passengers traveling from Fall River and New Bedford would decrease as compared to those presented in the DEIS/DEIR. Table 3.2-5 summarizes the proposed station stopping pattern for each of the alternatives.

Table 3.2-6 summarizes the total trip time from each terminal station (New Bedford and Fall River) to South Station based on the station stopping pattern in Table 3.2-5. These trip times are between 5 and 7 minutes faster than shown in the DEIS/DEIR due to the revised service plan. As shown in Table 3.2-6, the Stoughton Electric Alternative would be 6 to 7 minutes faster than the Whittenton Electric Alternative for service to New Bedford, and 8 minutes faster for service to Fall River.

The average trip times in Table 3.2-6 are based on simulation of the Stoughton Electric Alternative. Diesel alternatives would add approximately 20 seconds per station due to the additional time diesel locomotives need to accelerate from the stations and their lower maximum speeds. Deceleration rates would be identical to those of the electric alternatives. It is noted that although its operating plan skips a few stops, the peak period service has a longer travel time due to longer dwell times at each station in order to load and unload the higher numbers of passengers using the service during peak commuting hours. The off-peak period service would stop at every station but would have much shorter dwell times and would, therefore, have a slightly shorter average travel time than the peak service.

Table 3.2-5 Proposed Stopping Patterns (Stoughton and Whittenton Alternatives)

	Stoughton Alternative				Whittenton Alternative			
	Fall River Line		New Bedford Line		Fall River Line		New Bedford Line	
Station	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak
Battleship Cove								
Fall River								
Freetown								
Whale's Tooth								
Kings Highway								
Taunton Depot								
Dana Street								
Taunton								
Raynham Park								
Easton Village				1				1
North Easton								
Stoughton								
Canton Center								
Canton Junction								
Route 128[2]								
Hyde Park[2]								
Ruggles[2]								
Back Bay								
South Station								

1 One train in the evening would not stop at Easton Village.

2 Stopping patterns vary at Route 128, Hyde Park and Ruggles. Existing service to Route 128, Hyde Park and Ruggles stations does not stop every Providence and Stoughton train at these stops. The Stoughton Electric Alternative would provide additional opportunity to connect to these stations with a service to New Bedford and Fall River. The operating plan proposed seven additional morning peak period stops at Route 128, four additional morning stops at Hyde Park and three additional at Ruggles. The evening peak service would generally remain unchanged.

Table 3.2-6 Average Trip Time Table, Stoughton and Whittenton Electric Alternatives (hr:min)

	Stoughton Electric Alternative		Whittenton Electric Alternative	
Operation	New Bedford Trains	Fall River Trains	New Bedford Trains	Fall River Trains
Peak Period Service	1:17	1:15	1:24	1:23
Non-Peak Period Service	1:16	1:18	1:22	1:26

1 Overall travel times for each branch of the Stoughton and Whittenton Electric Alternatives were developed using the Rail Traffic Controller model.
2 Assumptions were made based on track and signal layout.
3 Express trains may have longer travel times than local trains since they only operate during peak periods.

Feeder Bus

The Feeder Bus plan for the South Coast Rail project is envisioned to connect the urbanized communities in the study area to the South Coast stations. A Feeder Bus network would provide an alternative to driving to stations and would support transit oriented development and other smart growth initiatives in the study area by connecting surrounding areas to the train station. The Feeder Bus network would provide frequent, convenient service connections with trains.

Three regional transit authorities currently provide local bus service within the region: Brockton Area Transit Authority (BAT), Southeastern Regional Transit Authority (SRTA) and Greater Attleboro Taunton Regional Transit Authority (GATRA). The SRTA and GATRA operators use a fleet of buses that accommodate bicycles, which would encourage multi-modal integration for the South Coast Rail project. Current bus operators would provide enhanced Feeder Bus service to the proposed stations for the selected Build Alternative. On February 8, 2012, a meeting was hosted by SRPEDD with representatives of each of the bus operators to review a draft version of the feeder bus plan and receive their input on the proposed plan. The following objectives guided the development of the plan:

- Identify potential route modifications to existing bus routes to integrate South Coast Rail and local bus services to the extent possible;
- Minimize the number of transfers required by transit riders to use the South Coast Rail system;
- Limit route modifications to the extent possible to avoid inconveniencing current bus users;
- For stations served by bus, accommodate buses within the station site and as close as possible to the station platforms; and
- Plan for ADA compliant pedestrian connections to bus stops adjacent to the station sites and within the South Coast Rail station sites.
- Feeder Bus service would connect the South Coast Rail stations with the services shown in Table 3.2-7. Further details on the decisions made in selecting these stations and service changes are provided in the Feeder Bus Service Analysis Report, Appendix 3.2-Aof this FEIS/FEIR.

Table 3.2-7 Proposed Feeder Bus Operations

Station Name	Operator	Route #	Extension Length (miles)	Existing Headway (minutes)	Proposed Peak Frequency
Easton Village	BAT	8	3.0	40	same
Taunton Station	GATRA	7	0.4	30	same
Dana Street Station	GATRA	18	0.3	30	same
Taunton Depot	GATRA	8	0.2	60	same
Freetown Station	SRTA	2	1.0	30	same
Fall River Depot	SRTA	2	0.4	20	same
Kings Highway	SRTA	8	0	45	same
Whale's Tooth	SRTA	1	0.7	20	same
Whale’s Tooth	SRTA	2	0	20	same

3.2.8.3 Layover Facility Operations

The following sections describe midday and overnight layover facility operations.

Midday Facilities

The South Coast Rail project would require midday storage in the Boston area, and would utilize the same midday layover facilities that are envisioned for the planned expansion of South Station. For the purpose of the operations simulations, all South Coast Rail trains are assumed to enter and leave the system over the Fort Point Channel Bridge. The operation simulations have been conducted by modeling these movements to identify any impacts that might occur to the NEC and South Station. As discussed above in Section 3.2.3.3, the South Station Expansion Project (including the layover facility component) has independent utility from the South Coast Rail project because it is necessary to meet future demand regardless of whether or not the South Coast Rail project is constructed and operated.

Overnight Layover Facilities

Both of the commuter rail alternatives would require overnight layover facilities along the Fall River Secondary and New Bedford Main Line. The preferred locations for these facilities are near the terminal stations to minimize non-revenue movements. A layover facility has been selected for each of the terminal stations – these locations are identified in Section 3.2.16. Trains either completing or initiating revenue runs would need to change ends (engineer walks through train to operate from other end), perform the required brake tests, and then proceed north into the layover facility. It is estimated that this movement would consume approximately 10 to 15 minutes, but would not reduce main line capacity.

Freight Operations

Although future freight demand was not modeled as part of the project, future operating windows for freight trains were included. Freight trains would be allowed to operate on the sections of track listed in Table 3.2-8, during the times specified. Each segment provides at least 10 hours per day of freight operations, typically in 1-hour windows during the day. These windows will allow existing freight customers to continue to receive goods via freight train service and eliminate conflicts between freight and passenger train operations.

Table 3.2-8 Freight Operating Windows

Time of Day From	To	Length of Window
Canton Junction to Stoughton Center (CSX)		
9:06:52	10:09:00	1:02:08
10:37:24	11:39:02	1:01:38
12:06:31	13:09:26	1:02:55
13:37:35	14:41:05	1:03:30
15:08:40	16:09:14	1:00:34
19:46:52	20:47:33	1:00:41
20:58:52	21:56:29	0:57:37
0:14:18	5:39:38	5:25:20
9:06:52	10:09:00	1:02:08
Total Freight Operating Window Time:		12:34:23
Winter Street Siding to Weir Junction North (MCRR)		
9:12:26	10:04:42	0:52:16
10:39:32	11:33:49	0:54:17
12:12:26	13:04:53	0:52:27
13:41:57	14:35:58	0:54:01
15:14:26	16:04:42	0:50:16
16:42:26	17:38:51	0:56:25
20:30:03	21:15:15	0:45:12
21:19:51	22:24:09	1:04:18
21:19:51	22:09:22	0:49:31
22:37:08	0:16:50	1:39:42
0:43:51	5:09:42	4:25:51
Total Freight Operating Window Time		14:04:16
Weir Junction South to Cotley Junction (CSX and MCRR)		
9:15:46	10:01:28	0:45:42
10:42:56	11:30:32	0:47:36
12:15:46	13:01:39	0:45:53
13:45:17	14:32:41	0:47:24
20:23:39	21:22:28	0:58:49
22:32:05	0:23:51	1:52:41
0:47:23	5:06:23	4:19:00
Total Freight Operating Window Time		10:17:05

Time of Day From	To	Length of Window
Myricks Junction to Fall River (MRCC)		
8:35:45	10:45:47	2:10:02
11:27:46	13:48:08	2:20:22
14:29:55	16:48:37	2:18:42
20:20:00	22:10:00	1:50:00
23:04:58	0:50:14	1:45:16
1:20:34	4:53:06	3:32:32
Total Freight Operating Window Time		13:56:54
Myricks Junction to New Bedford (MCRR)		
7:35:53	9:18:20	1:42:27
9:58:40	12:18:20	2:19:40
12:58:51	15:20:20	2:21:29
15:58:20	17:33:08	1:34:48
20:21:38	21:25:57	1:04:19
22:03:20	0:27:20	2:24:00
1:05:24	4:33:26	3:28:02
Total Freight Operating Window Time		14:54:45

Freight service would be restricted to standard freight size and weight, and would not support high-and-wide or double-stack operations where it does not currently provide high-and-wide or double-stack operations. Freight services is anticipated to continue on the track segments where freight is currently provided (on the Stoughton Line north of Stoughton Station, on the Attleboro Secondary, on the Stoughton Line in Taunton between Longmeadow Road and Weir Junction, and on the New Bedford Main Line and Fall River Secondary south of Weir Junction). No future freight service is currently

planned or anticipated on the currently out-of-service Whittenton Branch or Stoughton Line between Stoughton Station and Longmeadow Road.

3.2.8.4 Fare Collection

Fare collection for the commuter rail alternatives would be the same as the existing MBTA commuter rail lines. Fares would be collected on board the trains by conductors. Passengers would have the option to purchase individual tickets on board the trains or purchase single ride, multiple ride, or monthly passes from the MBTA or retail sites.

3.2.9 Track Infrastructure of the Rail Alternatives

Subsequent to the DEIS/DEIR, MassDOT has advanced the preliminary track design for the Stoughton Alternative and the Whittenton Alternative. All track changes have been minor. The design of bridge structures has been advanced, particularly for the Hockomock Trestle between Foundry Street and the Raynham Greyhound Park.

The FEIS/FEIR track layout for the Stoughton Alternative varies from the track layout included in the DEIS/DEIR in the following ways:

- A proposed north end double track on the New Bedford Main Line was cut back from Pig Farm Road to Tarkiln Hill Road;
- In the DEIS/DEIR, a passing siding was added on the Fall River Secondary near the Fall River Golf Club; and a siding was proposed from Freetown to Fall River Depot Station. This has since been changed to three separate sidings in an effort to reduce environmental impacts while maintaining operational flexibility. The sidings would be located at Freetown Station, near the Fall River Golf Club, and at the Fall River Depot Station;
- Weir Junction was reconfigured to provide 45 mph operations through the curve;
- A short second track was added at Battleship Cove; and
- A passing siding for freight trains was added at Taunton Depot Station.

3.2.9.1 FEIS/FEIR Track Design

All of the rail alternatives require reconstructing existing active tracks and constructing new tracks either on abandoned or new rights-of-way. The new track infrastructure would consist of new 132RE rail, new rail ties, new stone ballast, subballast and other track material. The horizontal and vertical geometry for the new track has been designed to conform to the applicable design speed for the alternatives in accordance with the MBTA commuter rail design standards and American Railway Engineering and Maintenance-of-Way Association design standards. The alignments have also been designed to minimize impacts to adjacent environmental resources and private properties. The proposed track typical sections are shown in Figures 3.2-1 and 3.2-2 (for the diesel alternatives) and 3.2-3 through 3.2-5 (for the electric alternatives).

3.2.9.2 Track Infrastructure—Stoughton Alternative

The New Bedford Main Line from Weir Junction in Taunton to the Whale’s Tooth Station, and the Fall River Secondary from Myricks Junction to Battleship Cove Station, are segments of track common to

both commuter rail alternatives as is the track from Raynham Junction to South Station. Only the segment from Raynham Junction to Weir Junction would differ between the alternatives. Except in certain locations, the track would be designed for a maximum authorized speed (MAS) of 100 MPH. Locations which would be designed for less than 100 MPH MAS would be at certain sidings (which would be too short to achieve 100 MPH), and south of the King's Highway Station, where it would be precluded by single track operations.

Stoughton Line

The existing single track commuter rail line would be upgraded and maintained to FRA Class 7. A new second track would be constructed from Canton Junction to the existing Stoughton Station, where existing passenger service ends. A new double track would extend south of Stoughton Station to the proposed North Easton Station. The remainder of the line south to Weir Junction would be single- track, with a 2.2-mile long double-track section in Raynham, and a 0.6 mile long double-track section in Taunton. Approaching Weir Junction, an additional 0.4 mile siding track would be provided for freight use only. Weir Junction would also be reconfigured to accommodate four tracks as well as 45 MPH for operations through the curve while maintaining existing rail connections. These track segments are listed in Table 3.2-9.

A frontage road would be constructed in Stoughton connecting to Morton Street to eliminate multiple grade crossings, and a new grade-separated crossing is proposed at Route 138 in Raynham. A trestle section is proposed in Easton and Raynham to minimize environmental impacts to the Hockomock Swamp Area of Critical Environmental Concern.

Table 3.2-9 Track Infrastructure – Stoughton Alternative

Track Segment	Single Track	Double Track	Triple Track	Quadruple Track	Total (miles)
Canton Junction to Stoughton Station[1]	-	3.8	–	–	3.8
Stoughton Station to Raynham Junction[1]	7.1	4.8	–	–	11.9
Raynham Junction to Weir Junction[1]	2.9	1.1	–	0.4	4.5
Weir Junction to Cotley Junction[2]	–	0.7	0.9	–	1.6
Cotley Junction to Myricks Junction[2]	–	3.3	–	–	3.3
Myricks Junction to Battleship Cove[3]	9.4	2.9	–	–	12.3
Myricks Junction to Whale's Tooth[2]	10.1	4.5	–	–	14.5
TOTAL (miles)	**29.5**	**21.1**	**0.9**	**0.4**	**51.9**

1 Stoughton Line
2 New Bedford Main Line
3 Fall River Secondary

New Bedford Main Line

The 19.4-mile existing track along the New Bedford Main Line would be upgraded and maintained to FRA Class 7 options. The line would be double-track from Weir Junction to Myricks Junction, with a 0.9-mile third track for freight movements near Taunton Depot Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 mile. The remainder of the line would be single-track, with the exception of 1.8-mile double-track section in Freetown and a 1.7-mile section in New Bedford. These sidings are required by the operations analysis and also allow flexibility between commuter and freight operations.

Fall River Secondary

The 12.3 miles of existing track along the Fall River Secondary would be upgraded and maintained to FRA Class 7 options. The majority of this line would be single-track with a 0.7 mile double-track segment at Myricks Junction. A 1.0-mile-long section of double track would be installed adjacent to the Fall River Golf Club. Three double-track sections are also proposed in Freetown and Fall River, at 0.6, 0.3, and 0.2 mile long, respectively, to allow flexibility between commuter and freight operations.

3.2.9.3 Track Infrastructure—Whittenton Alternative

The route for the Whittenton Alternative is similar to the Stoughton Alternative except in Raynham and Taunton. The New Bedford route would be 56.6 miles long and the Fall River route would be 54.3 miles long. This alternative would extend through the abandoned Stoughton Line, as previously described, and connect to the abandoned Whittenton Branch at Raynham Junction. The Whittenton Branch would extend south and west to the Attleboro Secondary at Whittenton Junction. Along the Attleboro Secondary, the Whittenton Alternative would extend to Weir Junction in Taunton. South of Taunton, the alternative would continue on the New Bedford Main Line and Fall River Secondary track, identical to the Stoughton Alternative.

Track infrastructure improvements would include 3.6 miles of new single-track on the Whittenton Branch and 2.2 miles of single-track reconstruction on the Attleboro Secondary with a 0.3-mile siding reserved for the proposed Dana Street Station. Improvements on the Stoughton Line between Canton Junction and Route 138 in Raynham would be the same as the Stoughton Alternative. Table 3.2-10 summarizes the track infrastructure improvements along the Whittenton Alternative.

Table 3.2-10 Track Infrastructure – Whittenton Alternative

Track Segment	Single Track	Double Track	Triple Track	Quadruple Track	Total (miles)
Canton Junction to Stoughton Station[1]	–	3.8	–	–	3.8
Stoughton Station to Raynham Junction[1]	7.1	4.8	–	–	11.9
Raynham Junction to Whittenton Junction[2]	3.6	–	–	–	3.6
Whittenton Junction to Weir Junction[3]	2.2	0.3	–	–	2.5
Weir Junction to Cotley Junction[4]	–	0.7	0.9	–	1.6
Cotley Junction to Myricks Junction[4]	–	3.3	–	–	3.3
Myricks Junction to Battleship Cove[5]	9.4	2.9	–	–	12.3
Myricks Junction to Whale's Tooth[4]	10.1	4.5	–	–	14.5
TOTAL (miles)	**32.4**	**20.3**	**0.9**	**0.4**	**53.5**

1 Stoughton Line
2 Whittenton Branch
3 Attleboro Secondary
4 New Bedford Main Line
5 Fall River Secondary

3.2.10 Grade Crossings

The majority of existing public grade crossings on the active railroad rights-of-way have automatic grade crossing gates and flashers installed. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems. Trains would use horns when they approach grade crossings. Sounding a horn while approaching a grade

crossing is a well-proven and effective method of providing warning of an approaching train. MassDOT is not recommending Quiet Zones for noise mitigation and has committed to designing the South Coast Rail project grade crossings to the FRA safety standards.

Grade crossings would be closed or consolidated whenever feasible. Private grade crossings would be closed, gated, and locked if possible; if not, new AHCW systems would be installed. At a minimum each public grade crossing would consist of automatic gates, LED flashers, and an electronic bell. Where required, this standard arrangement may be supplemented with additional equipment such as additional gates and cantilevered flashers to optimize visibility for the roadway approaches.

The AHCW train detection would be based upon constant warning technology known as predictors. This system detects the speed of the train as it moves towards the crossing and “predicts” the arrival time. Each crossing would be set to provide a consistent 30 seconds of warning ahead of the train’s arrival at the crossing. The AHCW system would communicate with the MBTA Operational Control Center (OCC) through a dedicated Fiber Optic line that would be provided as part of the South Coast Rail project. This Fiber Optic line would allow MBTA train dispatchers to communicate with and receive indications directly from the AHCW system at each grade crossing.

Each crossing would be supported by a minimum 8-foot by 8-foot aluminum shed that would house the AHCW system. The houses would be placed at the most advantageous quadrant of the crossing to not impede sight distance of pedestrians, motorists, and train engineers.

Each crossing would require a power utility feed from the nearest commercial source. Additional or supplemental devices may require additional system infrastructure to support a particular application such as traffic preemption or advance active warning signs. Each AHCW system would be supported by storage batteries during times of power outages. These batteries would be housed in a separate box (battery well) located adjacent to the AHCW housing.

Table 3.2-11 is a summary of the number of grade crossings by alternative. Information on the improvements proposed for each crossing is provided in Chapter 4.1. See Figures 4.1-44 through 4.1-53 in Volume II for mapping of existing and proposed grade crossings.

Table 3.2-11 Summary of Public Grade Crossings by Alternative

Commuter Rail Alternative	Existing Active Grade Crossings	Existing Grade Crossings Recommended for Closure	Proposed New Grade Crossings[1]	Total Proposed Grade Crossings
Stoughton Alternative	31	3	15	43
Whittenton Alternative	40	3	13	50

1 Includes grade crossings that are existing but not active

3.2.11 Bridges and Culverts

All of the rail alternatives require reconstructing undergrade bridges (railroad over road or river) and overhead bridges (highway over railroad) along the active and restored rights-of-way.

The conditions of the existing railroad bridges were evaluated to determine each bridge’s current state of repair and whether the bridge can meet industry design standards. The bridges were also evaluated

to determine if it was feasible to install additional track where required for the rail operations. Based on this evaluation, the following recommended improvements were developed.

Existing culverts along the rail corridors would typically be replaced in-kind (or widened, as feasible and appropriate, for environmental enhancement) to resist increased loading and to accommodate the wider track bed where necessary.

3.2.11.1 Typical Railroad (Undergrade) Bridge Structure Types

The following bridge structure types are currently proposed for the undergrade bridges on the rail alternatives. The structure type considered for specific locations is dependent on span length, number of spans, structure depth constraints, cost and constructability. For overhead (roadway bridges), a detailed type study in accordance with MassDOT criteria would be performed during preliminary design to determine the most appropriate structure type.

Concrete Box Girder—Concrete box girder superstructures are primarily used for single span bridges with smaller spans up to approximately 25 feet in length (Figure 3.2-11). The box girders are placed adjacent to each other, providing a deck for the ballast and track. This minimizes field construction duration and associated impacts to track service. The open deck configuration allows for adjustability in track alignments which can be advantageous during construction staging.

Steel Tub—Steel tub superstructures are primarily used for single span bridges with spans ranging from roughly 25 feet to 60 feet in length (Figure 3.2-12). Ballast is placed onto a ballast plate deck, which is supported by longitudinal stringers and intermediate diaphragms. Much of the fabrication can be done in the shop, minimizing field construction times and associated impacts to track service. The open deck configuration allows for adjustability in track alignments which can be advantageous during construction staging.

Steel Thru Girder—Steel thru girder superstructures are primarily used for single or multiple span bridges with spans greater than 60 feet in length (Figure 3.2-13). Ballast is placed onto a ballast plate deck supported by floor beams and the main load carrying plate girders. Multiple track thru girder bridges utilize a shared plate girder between each set of tracks. This structure type minimizes structure depth for longer spans, although field construction is more time consuming than that for concrete box girder and steel tub superstructures. These structures do not allow for much adjustability in track alignment, in some instances making them difficult to stage.

3.2.11.2 New Bedford Main Line Railroad Bridges

Of the 18 bridges (both undergrade and overhead) on the New Bedford Main Line, nine would require rehabilitation or reconstruction as part of the South Coast Rail project. The bridges being replaced are either unable to meet the load requirements for the commuter rail, have open decks, are too narrow, or are recommended for replacement to reduce maintenance costs.

Several bridges originally carried two tracks. Currently, each bridge carries a single track. Four of the new bridges would be designed to carry two tracks, while the other five would still carry a single track. Many of the existing bridges have open timber decks. The new bridges would have solid decks on which ballast, ties, and rails would be placed.

Where the new bridge would have a longer span than the current structure, the new abutments would be located behind the old ones, the old ones would be demolished to the high water line (as currently

proposed), and the land between the old and new abutments restored to provide wildlife passage under the bridge. This condition exists at the Cotley River (MP 38.93 and MP 39.46), the Cedar Swamp River (MP 42.14), and Fall Brook (MP 45.43).

Where a new bridge would have an equal span to the current structure, the existing stone abutments would be rehabilitated and reused, if feasible. In some cases, the current bridge has multiple spans that the new bridge would replace with a single span, eliminating the mid-bridge piers required to support multiple spans. This occurs at Wamsutta Street (MP 54.21).

Table 3.2-12 provides a list of bridge crossings (both undergrade and overhead) and indicates which ones would require rehabilitation or reconstruction as part of the currently envisioned New Bedford Main Line segment of the South Coast Rail project. Appendix 3.2-B includes a description of the proposed work at each of the bridge locations.

Table 3.2-12 Summary of Bridges – New Bedford Main Line

Bridge	Municipality	Type	Mile Post	Improvements Required
Taunton River	Taunton	Undergrade	35.56	Yes
Brickyard Road	Taunton	Undergrade	35.79	Yes
Route 24	Taunton	Overhead	37.69	Yes
Cotley River	Berkley	Undergrade	38.93	Yes
Cotley River	Berkley	Undergrade	39.46	Yes
Cedar Swamp River	Lakeville	Undergrade	42.14	Yes
Howland Road	Lakeville	Overhead	43.26	No
Fall Brook	Freetown	Undergrade	45.43	Yes
Route 140	New Bedford	Overhead	50.66	No
Dean Street[1]	New Bedford	Undergrade	53.31	No
Sawyer Street[1]	New Bedford	Undergrade	53.57	No
Coggeshall Street[1]	New Bedford	Undergrade	53.67	No
Cedar Grove Street	New Bedford	Undergrade	53.79	No
I-195 Ramp	New Bedford	Overhead	53.81	No
Weld Street/Route 18 Ramp	New Bedford	Undergrade	53.95	No
Logan Street	New Bedford	Undergrade	54.01	No
Route 18	New Bedford	Undergrade	54.17	Yes
Wamsutta Street	New Bedford	Undergrade	54.21	Yes

1 Reconstructed in 2011-2012

3.2.11.3 Fall River Secondary Railroad Bridges

Of the 30 existing bridges (both undergrade and overhead) on the Fall River Secondary, 11 would require rehabilitation or reconstruction as part of the South Coast Rail project. One new bridge would be required (the Golf Cart Road pedestrian bridge). The bridges being replaced are either unable to meet the load requirements for the commuter rail, or are too narrow.

Five of the new bridges would be designed to carry two tracks, while the other seven would carry a single track. Many of the existing bridges have open timber decks. The new bridges would have solid decks on which ballast, ties, and rails would be placed. Where a new bridge would have an equal span to the current structure, the existing stone abutments would be rehabilitated and reused, if feasible. In

some cases the current bridge has multiple spans that the new bridge would replace with a single span, eliminating the mid-bridge piers required to support multiple spans. This would be the case for at the Cedar Swamp River (MP 41.51), Golf Club Road (MP 48.11), and President's Avenue (MP 51.11).

Table 3.2-13 provides a list of bridges (both undergrade and overhead) and indicates which ones would require construction, rehabilitation, or reconstruction as part of the currently envisioned Fall River Secondary segment of the South Coast Rail project. Appendix 3.2-B provides a description of the proposed work at each of the bridge locations.

Table 3.2-13 Summary of Bridges – Fall River Secondary

Bridge	Municipality	Type	Mile Post	Improvements Required
Cedar Swamp River	Freetown	Undergrade	41.51	Yes
Route 24/79	Freetown	Undergrade	45.58	No
South Main Street/Route 79	Freetown	Overhead	46.25	No
Farm Road	Freetown	Undergrade	46.63	Yes
Farm Road	Fall River	Undergrade	47.75	No
Golf Cart Road (Pedestrian)	Fall River	Overhead	47.90	New
Golf Club Road	Fall River	Overhead	48.11	Yes
Miller's Cove Road	Fall River	Undergrade	48.62	Yes
Clark Street	Fall River	Overhead	48.93	No
Collins Road	Fall River	Undergrade	49.06	Yes
Ashley Street	Fall River	Undergrade	49.21	Yes
Canedy's Underpass	Fall River	Undergrade	49.57	No
New Street	Fall River	Overhead	49.81	No
Western Expressway/Route 79	Fall River	Overhead	49.96	No
Western Expressway Ramps	Fall River	Overhead	50.06	No
Weaver Street	Fall River	Overhead	50.09	No
Cove Street	Fall River	Undergrade	50.43	No
Clinton Street	Fall River	Undergrade	50.49	No
Brightman Street	Fall River	Overhead	50.69	No
Brownell Street	Fall River	Undergrade	51.03	Yes
President's Avenue	Fall River	Undergrade	51.11	Yes
Pearce Street	Fall River	Undergrade	51.20	Yes
Turner Street	Fall River	Undergrade	51.40	Yes
Central Street	Fall River	Overhead	52.05	No
NB Ramp	Fall River	Overhead	52.05	No
SB Ramp	Fall River	Overhead	52.06	No
I-195	Fall River	Overhead	52.07	No
Route 138/Davol Street	Fall River	Overhead	52.09	No
Western Expressway, NB & SB	Fall River	Overhead	52.09	No
Anawan Street	Fall River	Overhead	52.19	No
Channel near Battleship Cove	Fall River	Undergrade	52.38	Yes

3.2.11.4 Stoughton Line Railroad Bridges

Of the 18 existing bridges (both undergrade and overhead) along the Stoughton Line, 14 would require rehabilitation or reconstruction as part of the Stoughton Alternative. The bridges being replaced are unable to meet the load requirements for the commuter rail.

Five completely new bridges are required. Three of the new bridges that pass over the rail right-of-way are in locations where previous bridges have been filled in (Main Street and Bridge Street in Easton and Thrasher Street in Taunton). At these locations the bridges would be constructed on new abutments or the existing abutments that remain, and the embankment excavated to track grade below. One new bridge would be built where none now exists (Route 138 Bridge, at MP 31.31 in Raynham) to provide a grade separation. The largest new bridge would be the trestle through the Hockomock Swamp with about 284 spans. It would be about 8,500 feet long and 24 feet wide at the level of the bridge deck. The structure would consist of multiple precast pre-stressed concrete superstructure spans on driven h-pile bent piers. Figure 3.2-14 shows the typical cross section of the trestle through the Hockomock Swamp. The basis for the trestle design and methods for construction are described in the Hockomock Swamp Trestle Technical Memorandum (Appendix 3.2-C).

The bridges listed for replacement have open timber decks (or none at all). The new bridges would have solid decks on which ballast, ties, and rails would be placed. Where the existing bridge abutments are stone, and the span length remains the same, the stonework may be rehabilitated and reused, if feasible. Two of the bridges that would be reconstructed would be built over existing stone masonry arched bridges (Forge Pond and Beaver Meadow Brook) to preserve these historic structures.

In some cases the current bridge has multiple spans that the new bridge would replace with two spans, eliminating the mid-bridge piers required to support multiple spans. This would be the case for at the Taunton River where the three bridges currently have 11 spans, 16 spans and 17 spans. Each would be replaced by a two-span bridge. The Taunton River bridges would be constructed to enhance wildlife passage by moving the abutments back from the riverbank.

Table 3.2-14 provides a list of bridge crossings (both undergrade and overhead) and indicates which ones would require rehabilitation or reconstruction as part of the currently envisioned Stoughton Alternative for the South Coast Rail project. Appendix 3.2-B provides a description of the proposed work at each of the bridge locations.

As required by the Secretary's Certificate on the DEIR, the feasibility of a trestle through the Pine Swamp was evaluated. As documented in Appendix 3.2-D, a trestle could be constructed through Pine Swamp but is not practicable based on cost, particularly when considered in the context of impacts to biological resources. Pine Swamp therefore does not have the extraordinary wildlife habitat value on both sides of the right-of-way that justifies the additional $45 million expenditure necessary to construct a trestle. The proposed mechanically stabilized reinforced earth stabilized track bed through the Pine Swamp along with other proposed mitigation including modifications to existing culverts and additional wildlife crossings provide a reasonable cost-effective solution to reduce the barrier effect resulting from replacing the former tracks that is in keeping with the biological diversity and overall value of the Pine Swamp.

Table 3.2-14 Summary of Bridges – Stoughton Line

Bridge	Municipality	Type	Mile Post	Improvements Required
Revere Street	Canton	Undergrade	15.21	No
Forge Pond	Canton	Undergrade	15.79	Yes
Bolivar Street	Canton	Undergrade	16.11	Yes
Mill Brook (also called Beaver Meadow Brook)	Canton	Undergrade	16.56	Yes
Coal Yard Road	Stoughton	Undergrade	19.07	Yes
Totman Farm Road	Stoughton	Undergrade	20.85	Yes
Day's Farm Road (private)	Easton	Undergrade	21.57	Yes
Cowessett Brook (also called Whitman Brook)	Easton	Undergrade	21.75	Yes
Ames & Pond Streets	Easton	Undergrade	22.80	Yes
Small Creek (also called Queset Brook)	Easton	Undergrade	22.84	Yes
Main Street	Easton	Overhead	22.93	New
Bridge Street	Easton	Overhead	23.27	New
Hockomock Swamp Trestle	Easton	Undergrade	27.00 to 28.60	New
Bridge Street	Raynham	Overhead	30.20	Yes
I-495	Raynham	Overhead	30.48	No
Route 138	Raynham	Overhead	31.31	New
Thrasher Street	Taunton	Overhead	33.33	New
Taunton River	Taunton	Undergrade	34.38	Yes
Taunton River	Taunton	Undergrade	34.38	Yes
Taunton River	Taunton	Undergrade	34.73	Yes
Summer Street	Taunton	Overhead	34.80	No
Mill River	Taunton	Undergrade	34.90	Yes
High Street	Taunton	Overhead	35.00	No

3.2.11.5 Whittenton Alternative Bridges and Culverts

The Whittenton Alternative would require all of the bridge work described for the Stoughton Alternative with the exception of six bridges. These include Route 138 in Raynham, Thrasher Street, the three Taunton River bridges in Taunton, and the Mill River Bridge in Taunton (the Whittenton Alternative crosses the Mill River at a bridge upstream from the Stoughton Alternative crossing). The Whittenton Alternative would also require rehabilitation or reconstruction of all three of the existing bridges on the Whittenton Branch. A new bridge would replace the bridge that once spanned King Phillip Street. The existing stacked stone abutments do not provide adequate lateral or vertical roadway clearance. A new superstructure and abutments would be constructed to provide clearances in accordance with current standards including travel lanes and sidewalks. The Bay Street Bridge was recently filled in and would need to be reconstructed to provide adequate track clearance for the rail service. A new superstructure would be constructed on new abutments and the embankment fill excavated below to the proposed track grade. The Mill River Bridge associated with the Whittenton Alternative is now a five span structure; it would be replaced by a two-span bridge carrying a single track. The existing abutments would be demolished and the new abutments constructed behind the existing abutments. The existing abutments would then be demolished down to the high water level and the space between the old and new abutments graded to recreate the stream banks under the bridge.

Table 3.2-15 provides a summary of the bridges along the Whittenton Branch. Appendix 3.2-B provides a description of the proposed work at each of the bridge locations.

Table 3.2-15 Summary of Bridges – Whittenton Alternative

Bridge	Municipality	Type	Mile Post	Improvements Required
King Phillip Street	Taunton	Undergrade	30.38	New
Bay Street	Taunton	Overhead	31.58	Yes
Mill River	Taunton	Undergrade	32.16	Yes

3.2.11.6 Summary of Bridge Improvements

Table 3.2-16 provides a summary of bridge improvements for the Stoughton and Whittenton Alternatives. The table is a general summary of the required bridge work among the alternatives. The summary includes existing bridges to be reconstructed and new bridges required to restore/provide grade separation or traverse sensitive areas.

Table 3.2-16 Summary of Bridge Improvements by Alternative

Commuter Rail Alternative	Reconstruct Undergrade (Railroad) Bridges	Reconstruct Overhead (Highway) Bridges	New Bridges for Grade Separation or Environmental
Stoughton Alternative	31	3	6
Whittenton Alternative	29	4	5

3.2.12 Signals and Communications

The Signals and Communications design remains the same as described in the DEIS/DEIR. The following sections summarize the design and compare the Stoughton and Whittenton Alternatives.

3.2.12.1 Signals and Communications—General Overview

The rail alternatives require a new signal system throughout, with the exception of the NEC. The new signal systems would be required to include Positive Train Control (PTC) as mandated by Congress in the Rail Safety Act of 2008; the new signal system would be capable of stopping the train (“positive stop”) if the train engineer fails to operate the vehicle as directed by the signal system. For the purposes of this document, it has been assumed that the new signal system would be the same as the existing signal system technology implemented on the NEC. The FRA has already deemed this system compliant with the Act. The NEC system is a cab-based signal system, meaning that the signal and the allowable speed are presented to the engineer in the cab of the locomotive.

The communications system would include a new fiber optic conduit. This would allow the signal system and grade crossings to be connected to the MBTA OCC. The communications system would also connect the MBTA OCC to systems at station stops, including passenger warning, public information and address, security, fire alarm, and police call back systems. Provisions would be made for future expansion of systems, such as for fare collection.

3.2.12.2 Stoughton Alternative Signals and Communications

The Stoughton Alternative requires a new PTC signal system for the New Bedford Main Line, Fall River Secondary, and the Stoughton Line. Modifications to the existing NEC signal system are limited to updating the signal logic at the Junction Interlocking. These minor improvements would be needed to make the signal logic on the corridor consistent with the signal logic of the new system on the Stoughton Line.

3.2.12.3 Whittenton Alternative Signals and Communications

The Whittenton Alternative requires a new PTC signal system for the New Bedford Main Line, Fall River Secondary, Attleboro Secondary, Whittenton Branch, and Stoughton Line. Modifications to the existing NEC signal system are limited to updating the signal logic at the Junction Interlocking. These minor improvements would be needed to make the signal logic on the corridor consistent with the signal logic of the new system on the Stoughton Line.

3.2.13 Rolling Stock

Both the Stoughton and Whittenton Alternatives would use commuter rail technology on a fixed-guideway system with steel wheels operating on steel rails, with typically a single locomotive pulling (outbound) or pushing (inbound) a number of passenger coaches. On the MBTA system, coaches can be either single level or bi-level. Commuter rail trains would be powered by diesel or electric locomotives, depending on the alternative. The electric locomotives would be powered by a 25 kV/60 Hz overhead contact system (OCS). The diesel alternative would not require an OCS.

3.2.13.1 Coaches

Commuter rail trains would consist of eight coaches. The coaches would be either single level or bi-level if additional capacity is needed. The MBTA currently uses coaches manufactured by Bombardier, Kawasaki, Messerschmitt-Bolkow-Blohm and Pullman Standard BTC. Existing coaches on the MBTA system are rated for a top operating speed of 90 MPH. It is anticipated that modified versions of these same coaches would be used for electric operations to achieve a 100 MPH rating. This would not be required for diesel operations that would operate at a top operating speed of 79 MPH. Single level coaches can carry 125 to 130 passengers and bi-level coaches can carry 175 to 185 passengers.

3.2.13.2 Locomotives

There are three differences between diesel and electric locomotives that are noteworthy. First, electric trains have higher performance characteristics, particularly in terms of quicker acceleration. Second, top travel speeds differ: for diesel-powered commuter rail, the maximum speed is assumed to be 79 mph, the maximum current operating speed on the MBTA system; for electric commuter rail, the maximum speed is assumed to be 100 MPH, which is the maximum speed that can be operated without incurring significant signal costs. Electric locomotives require an overhead wire (a catenary) to distribute power to the electric locomotive. The MBTA does not currently have electric locomotives in their commuter rail system, though some diesel powered trains travel on the electrified NEC.

The following is a description of the diesel and electric locomotives:

Electric Locomotives

- Type – HHP-8 manufactured by Bombardier or similar

- Acceleration performance is better than diesel locomotives
- Top Travel Speed – 125 MPH
- Fuel – electric using an 25 kV/60 Hz overhead wire (catenary) to distribute power to the electric locomotive

Diesel Locomotives

- Type – F40PH's manufactured by EMD or similar
- Acceleration performance is less than electric locomotives
- Top Travel Speed – 103 mph
- Fuel – diesel or bio-diesel

Table 3.2-17 summarizes the number of new coaches and locomotives required for each commuter rail alternative. Figure 3.2-15 depicts the typical diesel and electric locomotives.

Table 3.2-17 Rolling Stock Requirements[1]

Alternatives	Locomotives	Coaches	Cab Cars
Stoughton	10	72	10
Whittenton	10	72	10

1 Includes spare locomotive, coaches, and cab cars since the MBTA currently does not have electric locomotives.

3.2.14 Electrification System

A new traction electrification system is required to provide electric power to locomotives for the electric commuter rail alternatives. The diesel alternatives would not require these infrastructure improvements.

The new traction electrification system would tie into the existing NEC electrification system with some modifications to that system. The traction electrification system would provide power to the trains from wayside traction power facilities through an OCS that distributes the power to the trains' pantographs. The pantographs, mounted on the roof of the rolling stock, would collect the electrical power from the OCS through mechanical contact by sliding under the OCS contact wire. The electrical circuit would be completed back to the source substation via multiple return paths, including running rails and static wires.

Three major elements would make up the traction electrification system:

- Traction Power System, which include traction power substations, switching stations and paralleling stations. Figure 3.2-16 illustrates a typical Traction Power Station.
- Overhead Contact System (OCS), which distributes the electrical power to the rolling stock, and includes the messenger and contact wires, and the associated supporting structures and

hardware. The track negative feeder wires are considered associated with the OCS. Figure 3.2-17 illustrates a typical OCS.

- Traction Power Return System, which makes up the running rails, impedance bonds and static wires.

The traction power system and OCS are described below.

3.2.14.1 Traction Power System

The traction power system would provide a network of electric traction power facilities that transform power from the utility power grid at 115 kV to the 25 kV voltage required by electric locomotives. The power is distributed from the traction power facilities to the trains via the OCS. For South Coast Rail, the proposed traction power system would be similar to the one currently in use on the NEC between New Haven, CT and Boston, Massachusetts, in order to take advantage of this existing infrastructure. This system is a 2x25 kV autotransformer alternating current system requiring three types of traction power facilities:

- **Main Substations (AKA Traction Power Substations)—**that draw power from the utility power grid. They are typically located near high voltage, overhead transmission lines. A typical main substation site is 150 feet by 200 feet.

- **Switching Stations—**here two sections of the traction power system powered from different main substations meet. Electricity can be distributed to different sections, and different sections can be energized, de-energized, isolated or interconnected. They are typically mid-way between main substations and switching station sites can be as large as 60 feet by 150 feet.

- **Paralleling Stations—**that are between main substations and switching stations, spaced about 6 miles apart. They allow sections to be connected in parallel. They contain less equipment than the main substation and switching stations and require a 40-foot by 80-foot site.

- **Wayside Power—**provide power and remote control of interlocking lighting and OCS disconnect switches. Wayside power locations are also used to power other systems such as signals and lighting. The wayside power cubicle, which would house much of the equipment, would be located at interlocking.

The traction power system would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River). A switching station would be required at the point where the Stoughton and Whittenton Alternatives join with the NEC. Figures 3.2-18 through 3.2-19 show the Traction Power System for the Stoughton and Whittenton Alternatives.

3.2.14.2 Overhead Contact System

The OCS would be a network of catenary wires that distributes power from the traction power system to electric locomotives. This system would have a contact wire and a messenger wire strung above every electrified track in the system, negative feeder wires and static wires and supporting structures to hold the catenary wire in place. The support system for the catenary would consist of pole structures with foundations, poles, guys, insulators, brackets, cantilevers, and other assemblies and components. For

the South Coast Rail project, there would be three types of catenary supports: single-track cantilever poles, twin-track cantilever structures and multiple track portals.

3.2.15 Stations

Station locations have remained as shown in the DEIS/DEIR, with the exception of the Stoughton Station and Downtown Taunton Station. Stoughton Station was relocated to eliminate grade crossing conflicts with traffic in Stoughton Center and to support downtown revitalization efforts. A discussion is provided of the site options considered for Stoughton Station relocation. Downtown Taunton Station as described in the DEIS/DEIR was replaced by Dana Street Station, due to development of the originally selected site near the GATRA bus terminal since the publication of the DEIS/DEIR. The Dana Street site was chosen as a replacement for the Downtown Taunton station site since it is a sizable vacant parcel along the right-of-way and is proximate to the previously selected Downtown Taunton site.

Station layout, parking, grading, and drainage designs for the North Easton, Raynham Park, Taunton, Taunton Depot, and Freetown locations have been advanced since completion of the DEIS/DEIR.

3.2.15.1 Station Description

New commuter rail stations generally would consist of high-level platforms, canopies, commuter parking, and a pick-up/drop-off area for buses and “kiss & ride” that conform to MBTA Commuter Rail Station design criteria and the Americans with Disabilities Act (ADA). High-level platforms would be constructed at a height that is 4 feet above the top-of-rail level, allowing for level-boarding onto all the commuter rail coaches for a 9-car train set (approximately 800 feet long). Platform configurations (i.e., side platform or center island platform) are dependent on the number of tracks, operations, and existing site constraints.

Most of the new commuter rail parking lots were sized to accommodate the park and ride ridership projected by CTPS for the particular station, plus a 20 percent increase to meet the 2030 parking demand and potential future growth. However, two of the station parking areas were designed to provide parking space counts that differ from the unconstrained park and ride projections. Taunton Station was designed with fewer spaces than the ridership model projected. Although there would be sufficient area to provide the required parking, the number of parking spaces was constrained to provide an area that could be used for transit-oriented development opportunities to improve the economic conditions of the local communities. The second commuter rail parking lot with a different design than projected demand levels was the Taunton Depot Station parking lot. This station would have more spaces than the projected demand in order to capture the ridership that might be unable to find adequate parking at Taunton Station, because these stations would be in close proximity to each other and Taunton Station was designed with constrained parking.

Local roads and parking lots would also be impacted due to installation of additional tracks/platforms. Existing parking and access drives have been replicated as closely as possible to avoid major disruption to existing stations and communities.

It is a goal of the project that the new commuter rail station designs would include amenities such as bike storage areas, pedestrian connections to neighboring streets/developments (where applicable), and commuter-related services such as newspaper stands and payment boxes. The MBTA would also explore implementing green technologies such as solar panels, Energy Star-compliant products, and environmentally friendly designs to the maximum extent practicable. Stations are intended to function

similarly to the majority of existing MBTA commuter rail stations; they would be unattended and would require self-pay parking. The proposed stations would not include station buildings, and water/sewerage facilities would not be required.

3.2.15.2 Station Sites

This section provides a description of each proposed station, including a general site description, number of parking spaces, platform description, driveway access, and bus/kiss & ride accommodations. A summary of the stations is provided in Table 3.2-18. Stormwater management and drainage designs for each station are described in Chapter 4.17, *Water Resources*.

Table 3.2-18 Summary of Stations

Station Name	Municipality	Station Type	Parking Spaces	Platform Type[4]	Stoughton Alternative	Whittenton Alternative
Canton Center	Canton	Existing	210 [1]	Side (2,Low)	x	x
Stoughton	Stoughton	Relocated	636	Side (2)	x	x
North Easton	Easton/Stoughton	New	501	Center Island	x	x
Easton Village	Easton	New	0 [2]	Side	x	x
Raynham Park	Raynham	New	432	Center Island	x	x
Taunton	Taunton	New	210	Side	x	-
Taunton Depot	Taunton	New	398	Center Island	x	x
Freetown	Freetown	New	173	Side	x	x
Fall River Depot	Fall River	New	518	Side	x	x
Battleship Cove	Fall River	New	0 [2]	Side	x	x
King's Highway	New Bedford	New	360 [3]	Side	x	x
Whale's Tooth	New Bedford	New	748	Side	x	x
Dana Street	Taunton	New	477	Side	-	x
TOTAL – NEW STATIONS					**10**	**10**
TOTAL – MODIFICATIONS TO EXISTING STATIONS					**2**	**2**

1 Existing lot
2 Pick up/Drop off only
3 Shared parking
4 All platforms are single high-level unless denoted otherwise

Canton Center

Canton Center Station is an existing station site off of Washington Street that would be modified to accommodate a second track (Figure 3.2-20). Two new 800 foot long low-level platforms with mini-high platforms would be constructed (one adjacent to each track). Modifications to the tracks and platforms would require minor changes to the parking layout in the existing lots near the station, and no adjustments to the amount of existing parking spaces would be expected. This station would continue to serve walk-in, bike-in and drive-in customers. The Canton Center Station design is summarized as follows:

- Parking Spaces – approximately 210 existing parking spaces would remain.

- Parking Lot Type – existing paved surface parking.
- Station Access Drive – driveway access from Washington Street.
- Bus/Kiss & ride Accommodations – no designated areas for bus or kiss & ride.
- Platform Type – two side platforms.
- Platform Dimension – 800-foot low-level platforms, 9.5 to 12 feet wide with mini-high platforms.
- Track Configuration – double track.
- Pedestrian Accommodations – a walkway would be installed from each platform to existing sidewalks along the Washington Street.
- Stormwater Management – existing drainage would remain.

Stoughton

The Stoughton Station would be relocated as part of the South Coast Rail project to eliminate conflicts with traffic in Stoughton Center and to meet regulatory requirements for access. Relocating the station would also be consistent with downtown revitalization efforts.

The existing Stoughton Station is currently the terminal station on the Stoughton Branch of the MBTA commuter rail service. At the current station location, stopped trains block the Wyman Street at-grade crossing while passengers board and alight the train. This situation has contributed to congestion in downtown Stoughton. Expanding commuter rail service to the South Coast will require modifications to this station to accommodate a second track, which would exacerbate the traffic congestion at the Wyman Street at-grade crossing under the current station configuration. The low-level platforms of the current station do not meet Americans with Disabilities Act (ADA) accessibility requirements and must be replaced by a high-level platform.

The DEIS/DEIR described the station relocation south towards Brock Street, out of the Wyman Street at-grade crossing. The crossing gates at Wyman Street would be deactivated while trains dwell at the station, allowing traffic to pass through the downtown area with fewer interruptions. At the location proposed in the DEIS/DEIR, the station would be on a track curve and, due to spatial constraints of train cars on the curve, would need to maintain low-level platforms with "mini high" sections to allow persons with disabilities to enter or exit the cars. However, low-level platforms with mini-high platforms do not meet current ADA accessibility requirements that stipulate high-level platforms at all new or reconstructed stations, where possible.

MassDOT analyzed four location options (with one additional variation); each option relocates the station south of the current Wyman Street at-grade crossing and provides high-level platforms to meet ADA accessibility requirements. The options are described below and summarized in Table 3.2-19.

- **Option 1**—Realign tracks and relocate station between Wyman Street and Brock Street with high-level platforms and parking on both sides of the tracks. This option is close to downtown. It would require acquisition of 0.3 acre of residential and 9.5 acres of industrial or commercial

properties, vertical circulation for access (a pedestrian bridge), and one connection across the tracks (via the pedestrian bridge). The estimated cost of this option would be $16 million.

Table 3.2-19 Stoughton Station Options

Option	Description	Cost ($M)
1	-Realign tracks and relocate station between Wyman Street and Brock Street with high-level platforms and parking on both sides of the tracks. -Close to downtown -Requires acquisition of 0.3 acre of residential and 9.5 acres of industrial or commercial properties, vertical circulation for access, and one connection across the tracks.	16
2	-Realign tracks and relocate station between Wyman Street and Brock Street with high-level platforms and parking on both sides of the tracks. -Close to downtown and has two means of crossing the tracks. -Requires acquisition of 0.2 acre of residential and 9.6 acres of industrial or commercial properties.	16
3	-Realign tracks and relocate station north of Brock Street with high-level platforms and parking on the west side of the tracks. -Close to downtown, opens 2.5 acres of land for potential development, and has two means of crossing the tracks. -Requires acquisition of up to 0.2 acre of residential and 9.6 acres of industrial or commercial properties, and vertical circulation.	16
3A	-Realign tracks and relocate station north of Brock Street with high-level platforms and structured parking on the west side of the tracks. -Close to downtown, opens 1.4 acres of land for potential development, has two means of crossing the track, and the second level of the garage provide easier access across the pedestrian bridge. -Requires acquisition of 0.2 acre of residential and 9.6 acres of industrial or commercial properties, and vertical circulation.	38
4	-Realign tracks and relocate station south of Brock Street with high-level platforms. -Does not require a pedestrian bridge, opens 1.2 acres of land for potential development. -Farthest from downtown, requires pedestrian crossings at Brock Street, impacts an on-site wetland and intermittent stream, and requires acquisition of 0.2 acre of residential property and 7.7 acres of industrial or commercial properties.	13

- **Option 2**—Realign tracks and relocate station between Wyman Street and Brock Street with high level platforms and parking on both sides of the tracks. This option is close to downtown and has two means of crossing the tracks (pedestrian bridge and at-grade crossing). It would require acquisition of 0.2 acre of residential and 9.6 acres of industrial or commercial properties. The estimated cost of this option would be $16 million.

- **Option 3**—Realign tracks and relocate station north of Brock Street with high level platforms and parking on the west side of the tracks. This option is close to downtown, would open 2.5 acres of land east of the tracks for potential development, and has two means of crossing the tracks (pedestrian bridge and at-grade crossing). It would require acquisition of up to 0.2 acre of residential and 9.6 acres of industrial or commercial properties, and vertical circulation (pedestrian bridge). The estimated cost of this option would be $16 million.

- **Option 3A**—Realign tracks and relocate station north of Brock Street with high level platforms and structured parking on the west side of the tracks. This option is the same as Option 3 except with the addition of a parking structure, which would allow for development on part of the parcel that would be used for surface parking under Option 3. It is close to downtown, opens 1.4 acres of land east of the tracks for potential development, has two means of crossing the track (pedestrian bridge and at-grade crossing), and the second level of the garage would provide

easier access across the pedestrian bridge. It would require acquisition of 0.2 acre of residential and 9.6 acres of industrial or commercial properties, and would require vertical circulation (pedestrian bridge). The estimated cost of this option would be $38 million due to the high cost of the parking structure.

- **Option 4**—Realign tracks and relocate station south of Brock Street with high level platforms. This option does not require a pedestrian bridge, opens 1.2 acres of land east of the tracks for potential development and requires fewer takings than the other options; this option is also the least expensive of the build options. It would be the farthest from downtown (via a 0.25-mile pedestrian path), would impact an on-site wetland and intermittent stream, would require pedestrian crossings at Brock Street to access the platforms, and would require acquisition of 0.2 acre of residential property and 7.7 acres of industrial or commercial properties. The estimated cost of this option would be $13 million.

Each option was reviewed with regard to operations and accessibility to select a station location and configuration that would meet operational and regulatory requirements and provides benefits to the community at a reasonable cost. Four options were eliminated from further consideration:

- Options 1 and 2, which provide parking on both sides of the tracks, were not favored because they would require vertical circulation (stairs/elevators). Keeping the parking on one side of the tracks, with the platform close to Brock Street, would make it less likely that vertical circulation would be required.

- Option 3A, which includes a parking garage, was not favored because of the high project cost. However, locating parking on the west side of the tracks under Option 3 does not preclude a future parking garage. Locating parking only on the west side of the tracks would also open up development opportunity for the downtown, including the Rose Street extension.

- All the alternatives require some land acquisition. Option 4 requires the least land acquisition but would require pedestrians to cross both the Brock Street at grade crossing and the Brock Street traffic flow to access the station from the parking area west of the track. Option 4 would also impact an on-site wetland and intermittent stream to accommodate the parking lot and stormwater storage area. This option was not favored.

The remaining option—Option 3—was advanced for analysis in the FEIS/FEIR as it would provide the best balance of cost and convenience of the options considered. Figure 3.2-21 shows the Stoughton Station relocation site plan. The existing Stoughton Station would be relocated from its present location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing, where it would accommodate a second track. Two new 800-foot-long, full-length high-level platforms would be constructed (one adjacent to each track). A pedestrian bridge with stairs and ramps would connect the two platforms. These modifications to the tracks and platforms would require a new parking layout to the west of the platforms. This station would continue to serve walk-in, bike-in and drive-in customers. The Stoughton Station design is summarized as follows:

- Parking Spaces – a new parking lot on the west side of the tracks would provide 636 total spaces consisting of 17 handicapped accessible and 619 standard spaces.

- Parking Lot Type –paved surface parking.

- Station Access Drive – main driveway access on the south side from Brock Street and also on the west side from Morton Street.
- Bus/Kiss & ride Accommodations – a 100-foot pick-up/drop-off area would accommodate up two 40-foot buses and provide a waiting area for kiss & ride.
- Platform Type – two side platforms with a pedestrian bridge (stairs and ramps).
- Platform Dimension – 800-foot high-level platforms, 12 feet wide.
- Track Configuration – double track.
- Pedestrian Accommodations – sidewalks would be constructed at the northern end of each platform connecting to existing sidewalks. South of the platforms, pedestrians may utilize the existing at-grade pedestrian crossing at Brock Street. A pedestrian bridge provides a link between the inbound and outbound platforms.
- Stormwater Management – space has been reserved for an infiltration basin and drainage would tie in to the municipal system.

North Easton

North Easton Station would be located in Stoughton and Easton at the rear of the Roche Brothers Plaza off of Route 138 (Figure 3.2-22). This existing retail plaza is anchored by Roche Brothers supermarket and recently constructed medical buildings. This station would primarily serve drive-in customers, although the station may attract some walk-in customers from the existing development in the plaza and from some nearby residences. The North Easton Station design is summarized as follows:

- Parking Spaces – 501 total spaces consisting of 10 handicapped accessible and 491 standard spaces.
- Parking Lot Type – paved surface parking.
- Station Access Drive – driveway access from Roche Bros. Way.
- Bus/Kiss & ride Accommodations –110-foot pick-up/drop-off area that would accommodate two 40-foot buses and 5 kiss & ride parking spaces.
- Platform Type – one center platform with a pedestrian bridge (stairs and ramps).
- Platform Dimension – 800-foot high level platform, 22 feet wide.
- Track Configuration – double track.
- Pedestrian Accommodations – a sidewalk would be installed along the access road that would connect with an existing sidewalk along Roche Bros. Way.
- Feeder Bus – there are no feeder bus connections envisioned for this station.

- Stormwater Management – stormwater would be collected and treated on site. The majority of runoff at this site would be directed to one of four infiltration basins. Runoff from the northern portion of the parking lot would flow to a bioretention basin.

Easton Village

Easton Village Station would be located immediately south of the historic Old Colony Railroad station that is part of the H.H. Richardson National Historic Landmark and is located along Sullivan Street in Easton (Figure 3.2-23). The site is within walking distance of downtown Easton and would be a village-style station serving walk-in and bike-in customers. The existing Old Colony Railroad Station now houses the Easton Historical Society and includes a small parking facility that would be partially reconfigured for pick-up/drop-off traffic flow through the lot. A small number of the spaces in the existing lot would be designated for kiss & ride. The Easton Station design is summarized as follows:

- Parking Spaces – no commuter parking would be provided, though some spaces in an existing private lot would be designated for kiss & ride.
- Parking Lot Type – kiss & ride only.
- Station Access Drive – existing driveway access from Mechanic Street and new exit to Mechanic Street.
- Bus/Kiss & ride Accommodations – no accommodation for buses is proposed within the existing lot. An existing parking facility would provide approximately 12 kiss & ride spaces and a new exit would be constructed to improve traffic flow through the lot.
- Platform Type – one side platform.
- Platform Dimension – 800-foot high-level platform, 10 feet wide.
- Track Configuration – single track.
- Pedestrian Accommodations – a ramp from the northern end of the platform down to Oliver Street would convey pedestrians to an existing sidewalk on Oliver Street. A ramp near the southern end of the platform down to an existing pedestrian underpass (under the tracks) would connect to an existing sidewalk on Sullivan Street.
- Feeder Bus – A Stonehill College shuttle would be provided and the existing BAT Route 9 would be extended.
- Stormwater Management – existing drainage conditions would be maintained.

Raynham Park

Raynham Park Station would be located adjacent to the Raynham-Park Simulcast Center (formerly, the Raynham-Taunton Greyhound Park) off of Route 138 (Figure 3.2-24). The station would serve walk-in, bike-in and drive-in customers. The Raynham Park Station design is summarized as follows:

- Parking Spaces – 432 total spaces consisting of 10 handicapped accessible and 422 standard spaces.

- Parking Lot Type – paved surface parking.
- Station Access Drive – access from Route 138 through the existing complex to station area.
- Bus/Kiss & ride Accommodations – independent access driveway leading to a 110-foot pick-up/drop-off area that would accommodate two 40 foot buses and kiss & ride.
- Platform Type – one center platform with a pedestrian bridge (stairs and ramps).
- Platform Dimension – 800-foot high level platform, 22 feet wide.
- Track Configuration – double track.
- Pedestrian Accommodations – walkways would be added in conjunction with future transit oriented development.
- Feeder Bus – there are no feeder bus connections envisioned for this station.
- Stormwater Management – stormwater would be collected and treated on site. Runoff would be directed to a bioretention basin to the north of the site or bioretention swale south of the site.

Taunton (Stoughton Alternative)

Taunton Station would be located along Arlington Street near Dean Street (Route 44), adjacent to the historic Old Colony Railroad Station that currently serves an existing real estate business (Figure 3.2-25). The City of Taunton has begun the process of remediating this brownfield site in anticipation of a future train station. The site is within walking distance of downtown and would be utilized for future transit-oriented development. The station would serve walk-in, bike-in and drive-in customers. The Taunton Station design is summarized as follows:

- Parking Spaces – 210 total spaces consisting of 8 handicapped accessible and 202 standard spaces.
- Parking Lot Type – paved surface parking.
- Station Access Drive – driveway access from Arlington Street.
- Bus/Kiss & ride Accommodations – a 110-foot pick-up/drop-off area would accommodate up two 40-foot buses and provide a waiting area for kiss & ride. Wide aisles and adequate turning radii provide a bus route through the parking lot.
- Platform Type – one side platform.
- Platform Dimension – 800-foot high level platform, 12 feet wide.
- Track Configuration – single track (with a freight siding).
- Pedestrian Accommodations – walks would be installed from the platform along the access driveway out to Arlington Street for future walkway connections.

- Feeder Bus – reroute GATRA Route 7 for access to the station; reroute GATRA Routes 6 and 18 for better transfer access at Taunton Green.

- Stormwater Management – stormwater would be collected and treated on site. Runoff would be directed to a bioretention basin. A perforated underdrain would convey treated water to the municipal system.

Taunton Depot

Taunton Depot Station would be located off of Route 140 in Taunton at the rear of a shopping plaza that contains Target, Home Depot, and other stores (Figure 3.2-26). This station would serve walk-in, bike-in and drive-in customers. The Taunton Depot Station design is summarized as follows:

- Parking Spaces – 398 total spaces consisting of 9 handicapped accessible and 389 standard spaces.

- Parking Lot Type – paved surface parking.

- Station Access Drive – driveway access through the existing Target Plaza off of Route 140 connecting with a new driveway behind the Target to the new station parking area.

- Bus/Kiss & ride Accommodations –a 155-foot pick-up/drop-off area would accommodate up to three 40-foot buses and provide a waiting area for kiss & ride. Wide aisles and adequate turning radii provide a bus route through the parking lot.

- Platform Type – one center platform with a pedestrian bridge over the tracks (stairs and ramps).

- Platform Dimension – 800-foot high-level platform, 22 feet wide.

- Track Configuration – triple track (two for commuter rail adjacent to the platform and one freight track not adjacent to the platform).

- Pedestrian Accommodations – a sidewalk would be installed adjacent to the proposed access driveway out through the Target Plaza, connecting with the existing sidewalk on Taunton Depot Drive.

- Feeder Bus – The existing GATRA Route 8 would be extended a short distance to provide a stop at the station.

- Stormwater Management – stormwater would be collected and treated on site. Runoff would be collected in three lined bioretention basins.

Freetown Station

Freetown Station would be located on South Main Street (Figure 3.2-27). The site is currently occupied by a self-storage business, and is near the Fall River Executive Park and the proposed Riverfront Business Park. The station would serve drive-in customers and customers shuttled between the station and the industrial parks. The area around the site has been considered for future transit oriented development. The Freetown Station design is summarized as follows:

- Parking Spaces – 173 total spaces consisting of 7 handicapped accessible, and 166 standard spaces.
- Parking Lot Type – paved surface parking.
- Station Access Drive – driveway access off South Main Street.
- Bus/Kiss & ride Accommodations – a 110-foot pick-up/drop-off area would accommodate up two 40-foot buses and provide a waiting area for kiss & ride. Wide aisles and adequate turning radii provide a bus route through the parking lot.
- Platform Type – one side platform.
- Platform Dimension – 800-foot high-level platform, 16 feet wide.
- Track Configuration – double track.
- Pedestrian Accommodations – sidewalks would be installed from the platform out to South Main Street for future walk connections.
- Feeder Bus – The existing SRTA Route 2 would be extended 1 mile to the proposed station.
- Stormwater Management – stormwater would be collected and treated on site. Runoff is directed to infiltration basins.

Fall River Depot

Fall River Depot Station would be located 1 mile north of downtown Fall River at Route 79 and Davol Street at the site of the former train station (Figure 3.2-28). A proposed parking deck would be installed at this location to limit surface parking and provide space for future transit-oriented development. This station would serve walk-in, bike-in and drive-in customers. The Fall River Depot Station design is summarized as follows:

- Parking Spaces – 518 total spaces consisting of 11 handicapped accessible and 507 standard spaces.
- Parking Lot Type – paved surface parking with a one-level parking deck.
- Station Access Drive – driveway access from Davol Street and Pearce Street.
- Bus/Kiss & ride Accommodations – independent access driveway that would accommodate up to four 40-foot buses and 10 kiss & ride parking spaces.
- Platform Type – one side platform.
- Platform Dimension – 800-foot high-level platform; 12 feet wide.
- Track Configuration – double track.

- Pedestrian Accommodations – sidewalks would be installed along the frontage of Davol, Pearce, and Turner Streets connecting to existing sidewalks in the vicinity of the site. Sidewalks would be extended through the site and connect with ramps and stairs for platform access.

- Feeder Bus – Pedestrian access would be improved providing a connection to SRTA Route 2; reroute SRTA Route 14 to access the station;

- Stormwater Management – stormwater would be collected by catch basins which would tie in to the municipal system.

Battleship Cove

Battleship Cove Station would be located behind the Ponta Delgada monument along Water Street in Fall River (Figure 3.2-29). The station is a platform-only station that would not operate year-round. Serving the downtown and the Battleship Cove tourist area, the station is planned to accommodate walk-in and pick-up/drop-off customers. The City of Fall River constructed the Ponta Delgada monument, which includes a pick-up/drop off loop road, in anticipation that this site would be utilized as a commuter rail station. Work on Battleship Cove Station would need to be coordinated with the Route 79 construction project that is proposed by MassDOT's Highways Division (MassHighways). The Battleship Cove Station design is summarized as follows:

- Parking Spaces – pick-up/drop-off only.

- Parking Lot Type – pick-up/drop-off area on existing paved loop driveway.

- Station Access Drive – driveway access off Water Street.

- Bus/Kiss & Ride Accommodations – the paved loop driveway would accommodate up to three 40-foot buses and passenger vehicles for pick-up and drop-off of commuter rail passengers.

- Platform Type – one side platform.

- Platform Dimension – 800-foot high-level platform, 12 feet wide.

- Track Configuration – single track.

- Pedestrian Accommodations – a walkway would be installed from the platform to existing sidewalks along the pick-up/drop-off loop road.

- Feeder Bus –SRTA Routes 6 and 7 were rerouted in May 2012 to better serve the Battleship Cove area.

- Stormwater Management – existing drainage would be maintained.

King's Highway

King's Highway Station would be located in northern New Bedford south of King's Highway, immediately east of Route 140 (Figure 3.2-30). This station would occupy part of a site that is an existing shopping plaza. The station would serve walk-in, bike-in, and drive-in customers. The King's Highway Station design is summarized as follows:

- Parking Spaces – 360 total existing spaces consisting of 12 handicapped accessible and 348 standard spaces. Spaces would be shared with existing retail (movie theater) uses.
- Parking Lot Type – existing paved surface parking (shared).
- Station Access Drive – access from King's Highway through existing shopping complex to shared parking area and pick-up/drop-off area.
- Bus/Kiss & Ride Accommodations – 115-foot pick-up/drop-off area would accommodate up to two 40-foot buses and provide a waiting area for kiss & ride.
- Platform Type – one side platform.
- Platform Dimension – 800-foot high-level platform, 12 feet wide.
- Track Configuration – double track.
- Pedestrian Accommodations – a ramp would be installed at the northern end of the platform down to a sidewalk that would be extended adjacent to the tracks northward to connect into existing sidewalks on King's Highway.
- Feeder Bus –SRTA Route 8 provides service to the station.
- Stormwater Management – existing drainage would be maintained.

Whale's Tooth

Whale's Tooth Station would be located on Acushnet Avenue at the existing Whale's Tooth parking lot, which was constructed by the City of New Bedford in anticipation of the commuter rail project (Figure 3.2-31). The lot would be modified to include accessible spaces near the station platform, a pick-up/drop off area for buses and kiss & ride, and to provide better connections to Acushnet Avenue. The station would include intermodal connections, potentially including ferry services. The station would serve walk-in, bike-in, and drive-in customers. The Whale's Tooth Station design is summarized as follows:

- Parking Spaces – 748 total spaces consisting of 32 handicapped accessible and 716 standard spaces.
- Parking Lot Type – existing paved surface parking.
- Station Access Drive –driveway access off of Acushnet Avenue.
- Bus/Kiss & ride Accommodations – a 135-foot pick-up/drop-off area would accommodate up two 40-foot buses and provide a waiting area for kiss & ride. Wide aisles and adequate turning radii provide a bus route through the parking lot.
- Platform Type – one side platform.
- Platform Dimension – 800-foot high-level platform, 16 feet wide.
- Track Configuration – double track.

- Pedestrian Accommodations – ramps and stairs from the platform would be installed to connect with existing sidewalks adjacent to the existing parking facility.

- Feeder Bus – Pedestrian connections to the station would be improved and SRTA Routes 1, 3 and 11 would be extended.

- Stormwater Management – existing drainage would be maintained.

Dana Street (Whittenton Alternative)

Dana Street Station would be located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton (Figure 3.2-32). The site is a currently vacant lot. The station would serve walk-in, bike-in, and drive-in customers. The Dana Street Station design is summarized as follows:

- Parking Spaces – 477 total spaces consisting of 9 handicapped accessible spaces and 468 standard spaces.

- Parking Lot Type – paved surface parking.

- Station Access Drive – driveway access from Dana Street.

- Bus/Kiss & ride Accommodations – a 110-foot pick-up/drop-off area would accommodate up two 40-foot buses and provide a waiting area for kiss & ride. Wide aisles and adequate turning radii provide a bus route through the parking lot.

- Platform Type – one side platform.

- Platform Dimension – 800-foot high-level platform, 12 feet wide.

- Track Configuration – double track.

- Pedestrian Accommodations – walkways would be provided that lead to the platform. Additional sidewalks would be constructed along Dana Street and Danforth Street, and future walkways could provide a continuous connection to downtown.

- Feeder Bus – GATRA Route 18 would be rerouted to provide access to the station.

- Stormwater Management – space has been reserved for a basin and drainage would tie into the municipal system.

South Station – All Rail Alternatives

The South Coast Rail alternatives would utilize future expanded operational capacity at South Station already being planned by MassDOT to fulfill existing and future needs independent of the South Coast Rail project; described in Section 3.2.3.3 as part of the No-Build Alternative.

The initial operational analyses conducted for the rail alternatives assumed expansion of South Station up to a capacity of fifteen tracks, which was the expansion considered reasonably foreseeable at that time. The operational analyses showed that the Stoughton and Whittenton Alternatives would be

operationally feasible. Without expansion of South Station the operational performance of these alternatives would suffer.

3.2.16 Layover Facilities

Both of the rail alternatives would require two overnight layover facilities, one on the Fall River Branch and one on the New Bedford Main Line. A midday layover facility would also be necessary near South Station in Boston. The overnight layovers would be necessary to store trains when they complete their evening runs and before morning service. The midday layover would be needed to store trains near South Station in between the AM and PM peak periods.

The overnight layover facilities ideally would be located close to the terminal stations at the end of the New Bedford Main Line and Fall River Secondary. If the layover facilities are near the termini, trains would not have to travel far to get to the start of their morning trips or from the end of their evening trips. If the layover facilities are distant from the termini, trains would need to make a long distance non-revenue (deadhead) movement before they start their morning trips or after they end their evening trips. The same logic is true for locating the midday layover facility as close to South Station as possible.

3.2.16.1 Overnight Layover Facilities

The DEIS/DEIR identified five alternative sites for overnight layover facilities. Church Street and Wamsutta sites were identified on the New Bedford Main Line, and the ISP Site, Weaver's Cove East, and Weaver's Cove West were identified on the Fall River Secondary. The DEIS/DEIR did not identify a preferred site on either branch. These sites were identified since they provide ample space for the layover facility program that includes:

- Six tracks approximately 950 feet long: five to store train sets and one track for maintenance equipment;
- 25-foot-wide roadway around the perimeter and between track pairs;
- Parking for approximately 40 cars including two handicapped spaces;
- Lighting for parking lot and between the tracks; and
- Storage building and electrical substation.

This program results in a need for a site that has a rectangular shape that is approximately 1,500 feet long and 180 feet wide.

Subsequent to the DEIS/DEIR, the alternative sites were reviewed and recommended sites identified on each branch, as documented in the February 2012 Layover Facility Site Selection (provided in Appendix 3.2-E). Drainage and stormwater management for these sites is described in the Chapter 4.17, *Water Resources*.

On the *New Bedford Main Line*, Wamsutta was considered the most favorable location to site a New Bedford layover facility as it has less environmental impact than the Church Street site from the perspective of land acquisition, tax revenue loss, wetlands, and hazardous materials. Wamsutta would also be operationally more efficient with its close proximity to the terminal station, saving the project roughly $500,000 annually.

On the *Fall River Secondary*, Weaver's Cove East was considered the most favorable location for a Fall River layover facility as it has the least environmental impacts of the Fall River sites with the fewest land acquisition requirements, wetland impacts, impacts to cultural resources and to wild and scenic rivers, and from the perspective of encountering hazardous materials. Weaver's Cove East would also be operationally more efficient than the ISP site with its close proximity to the terminal station, saving the project roughly $500,000 annually.

Wamsutta Site Overnight Layover Facility Site

This site is located on the east side of the right-of-way, opposite the proposed Whale's Tooth Station and adjacent to an existing CSX freight yard, near MP 54.7 (Figure 3.2-33). The Wamsutta site layover facility design is summarized as follows:

- Distance from Terminal – 0.3 mile south of Whale's Tooth Station
- Lead Track – single lead track
- Length of Yard – 1,200 feet
- Width of Yard – 200 feet
- Highway Access – 400-foot driveway to Wamsutta Street

Weaver's Cove East Overnight Layover Facility Site

This site is located on the east side of the right-of-way, opposite the formerly proposed Weaver's Cove LNG Site in Fall River, near MP 49.8 (Figure 3.2-34). The Weaver's Cove East site layover facility design is summarized as follows:

- Distance from Terminal – 1.5 miles north of Fall River Depot Station; 2.6 miles north of Battleship Cove Station
- Lead Track – single lead track
- Length of Yard – 1,050 feet
- Width of Yard – 200 feet
- Highway Access – 440-foot driveway to North Main Street

3.2.16.2 Midday Layover Facilities

The South Coast Rail would require midday storage in the Boston area. This is being investigated separately as part of the South Station Expansion Project, which has independent utility from the South Coast Rail project.

On April 19, 2013 the Secretary of Energy and Environmental Affairs issued the Certificate on the Environmental Notification Form (ENF) for the South Station Expansion project. The project also includes the construction of layover facilities at one or more sites within the greater Boston area. After completion of a layover facility alternative analysis that evaluated 28 potential locations, three sites for

new and/or expanded layover facilities were further considered as part of the ENF. These potential layover locations include:

- The Boston Transportation Department-owned Tow Lot located along Frontage Road approximately 1 track-mile from South Station;
- Beacon Yard Park a freight yard and intermodal terminal most recently used by CSX Transportation, Inc. (CSX) located along Cambridge Street in the Allston section of Boston, approximately 4 track-miles on the MBTA Framingham/Worcester Line from South Station;
- Readville Yard 2, an existing MBTA layover yard and maintenance facility located off Wolcott Court in the Hyde Park section of Boston) approximately 9 track-miles from South Station.

It was determined that no single remaining layover facility alternative has the physical space to fulfill the entire projected 2040 layover need, while layover of too many train sets approaching South Station from one location could cause conflicting railroad operations and create a bottleneck. The Secretary's Certificate requires MassDOT to evaluate a combination of the three recommended sites to assess how they can be integrated with the existing four layover sites serving South Station.

Should a midday layover solution in Boston not be available at the projected opening year of the South Coast Rail project, the projected operational performance for the rail alternatives may not be attainable, reducing the rail alternatives' ability to meet the project purpose and potentially affecting system-wide rail operational performance.

3.2.17 Property Acquisition

This section describes the property acquisition required for the rail alternatives. Property acquisition for the commuter rail alternatives includes land required for the construction of the railbed and track, bridges and culverts, rights-of-way, retaining walls, grade crossings, stations, layover facilities, and electrification of the alternatives.

For purposes of this discussion, "property acquisition" is defined as obtaining greater than a 500-square-foot portion, or a sliver of land more than 10 feet wide, of any parcel outside of the existing rights-of-way to accommodate permanent construction impacts, based upon conceptual engineering plans. Narrow slivers of parcels are not considered in the evaluation of property acquisition, given the scale and accuracy of the conceptual design. Temporary construction impacts beyond the limits of the existing rights-of-way would not require land acquisition (utilizing temporary construction easements instead) and are therefore not considered in this evaluation. Aerial photographs and public Massachusetts GIS information were examined in reference to preliminary engineering plans to identify encroachments onto adjacent parcels. Final engineering plans may show an increase or decrease of the actual area of acquisition required.

When evaluating each property acquisition, conceptual design plans (in CAD format) were compared with public GIS information. Where proposed construction required full-parcel acquisition, property size for each of these parcels was gathered from existing information contained at Assessors' offices in each municipality. The design endeavored to limit property impact to partial acquisitions wherever possible, unless partial-parcel acquisitions resulted in the remaining parcel being unusable to the existing owner. In these instances, the analysis accounts for full-parcel acquisitions. Where partial-parcel acquisition was required, property acquisition was calculated utilizing the public GIS information contrasting to

proposed limits of work at each function. Parcel acquisition needs would be re-evaluated during final design using more detailed property boundary data and refined right-of-way requirements mapping.

For new track right-of-way, layover facilities and electrification equipment, property acquisition has been limited to minimum footprints required to support each function (as described above) and related amenities. Related amenities include access roads for maintenance, stormwater management facilities, and employee parking areas where required.

Where property acquisition is required, the goal for MassDOT would be to reach agreements with existing owners for purchase of properties required by the project. However, the Eminent Domain process may be required. Once property has been acquired for the project, it is expected that the Commonwealth (or one of its assigns) would retain ownership of each parcel.

Property acquisition by alternative has been summarized in Table 3.2-20. Values in the table reflect both full and partial takings required for each alternative. Table 3.2-21 provides a summary of property acquisitions by layover facility.

Table 3.2-20 Summary of Property Acquisition by Alternative (Acres)

	Stations	Right of Way	Electrification	Total
Stoughton Electric	62.50	47.70	2.20	112.40
Stoughton Diesel	62.50	47.70	0.00	110.20
Whittenton Electric	54.80	55.50	2.20	112.50
Whittenton Diesel	54.80	55.50	0.00	110.30

Table 3.2-21 Summary of Property Acquisition by Layover Site (Acres)

Layover Facility	Total
Weaver’s Cove East Layover Facility (Fall River Secondary)	18.43
Wamsutta Layover Facility (New Bedford Main Line)	5.90

Chapter 4.2, *Land Use and Zoning*, provides a more detailed breakdown of property acquisition requirements of each alternative by municipality and project element.

3.2.18 Cost

This section summarizes the estimated capital costs for the rail alternatives presented as incremental funding needs over a 30-year period, a typical financing period. Capital equipment costs are presented as the incremental cost of the life of the equipment as defined by FTA guidelines. The net result of this analysis is the identification of the annual funding requirements above and beyond the costs already programmed for the horizon year (No-Build Alternative).

Capital costs include the cost of new infrastructure such as new track and stations, and cost of new transportation equipment, such as rail cars. The first step in developing the financial impact analysis is to convert the capital and operating cost estimates from base year (2012) dollars to the projected year-of-expenditure dollars.

The capital cost estimates for both infrastructure and equipment were escalated to year-of-expenditure based on current FTA criteria. These costs were then annualized based on the useful life of each element and a discount rate of 7 percent, in accordance with FTA guidelines.

Table 3.2-22 provides a summary of the cost estimate and analysis for the Stoughton Electric Alternative. The Whittenton Alternative would have a similar cost. Based on the cost estimates developed for the DEIS/DEIR, the cost of the diesel alternatives would be approximately 30 percent lower than the electric alternatives.

Table 3.2-22 Stoughton Electric Alternative Capital Cost

Item	
Total Infrastructure Cost	$1,090,568,000
Real Estate Cost	$ 52,430,000
Professional Services Cost	$ 147,767,000
Contingency	$ 345,700,000
Vehicle Cost	$ 180,970,000
Total	$1,817,435,000

Notes: Total infrastructure costs were estimated in 2012 dollars.
Professional services are 13.55 percent of infrastructure costs without contingency. Professional services include Design, Permitting, Construction Phase Inspection & Project Management.
Contingencies are 31.70 percent of infrastructure costs and include Indirect Soft Costs, Mitigation Contingency, and Construction Contingency.
Escalation was calculated at 3.25 percent per year per FTA criteria.

The Operations and Maintenance Cost (O&M) was calculated for the Stoughton Electric Alternative. The total amount in 2012 dollars is $ $33,914,000. The O&M cost for the Whittenton Electric Alternative would be $36,210,000 because of the longer length of track compared to the Stoughton Electric Alternative. Based on the O&M cost estimates developed for the DEIS/DEIR, the diesel alternatives would be approximately three percent lower than the electric alternatives.

3.2.19 Construction of the Rail Alternatives

This section describes the methodologies that would be used to construct the Stoughton or Whittenton Alternatives, including railbed and track, bridges and culverts, retaining walls, grade crossings, stations, layover facilities and electrification systems. The following sections describe the conceptual construction methodology. Detailed construction plans and sequencing would be developed in final design.

3.2.19.1 Track Construction—General Description

The proposed track work consists of construction of new track structure along existing active freight and passenger service areas as well as construction of new track along abandoned or new rights-of-way. The new track construction consists of single, double, and triple track sections and passing sidings, replacement of existing industry turnouts, and special track work. Common elements of the track construction include excavation, new track bed, ditches, ballast, concrete ties, and new steel rail. These improvements include the specific elements listed below.

- The existing ballast would either be undercut to remove silt, returning the existing ballast material to current specifications, or be removed and replaced by new ballast. Undercutting would clean the entire ballast section by lifting it into vibrating screens and returning the clean ballast to the rail bed, while silt would be wasted onto the shoulder or carried away. Regardless of which technique is utilized, at least 12 inches of clean ballast is required below the ties.

- The existing subballast would either remain in place with possible regrading or would be excavated and replaced with new material to meet current specifications.

- Ties would be completely replaced. It is anticipated that the entire line would be outfitted with concrete ties, elastomeric pads, and compression Pandrol rail clips.

- The existing jointed rail would be replaced with new 132 pound continuously welded rail.

- Existing embankments would be modified to accommodate the new track cross section, including (where appropriate) side drainage ditches, ballast side slopes, and retaining walls.

The methodology for the track construction for each segment is described in the following sections.

Track Construction on Active Rail Lines

Segments of the construction would occur on active track where service would need to be maintained during construction activities. The goal of the construction method for these segments is to minimize disruption to these services. Following is a summary of track segments with active track.

- **Northeast Corridor—**The NEC has passenger and freight service by Amtrak, the MBTA and CSX. The MBTA operates from 4 AM to 2 AM; Amtrak operates from 5 AM to 1 AM. Service operates seven days per week.

- **Stoughton Line—**The MBTA's Stoughton Line has commuter rail service from the existing Stoughton Station north to Canton Junction, where it connects to the NEC. The MBTA operates from 5 AM to 12 AM during weekdays only. MCRR has an active freight railroad operation that utilizes the MassDOT-owned Stoughton Line track through Taunton to the Dean Street area. MCRR operates on this section one to three days per week.

- **New Bedford Main Line—**CSX and MCRR have active freight railroad operations on the MassDOT owned New Bedford Main Line from New Bedford to Taunton where it connects to the Attleboro Secondary at Weir Junction. CSX currently operates along this line two days a week between Weir Junction and Cotley Junction and MCRR operates three days per week between Weir Junction and Whale's Tooth in New Bedford.

- **Fall River Secondary—**MCRR has an active freight railroad operation on the MassDOT owned Fall River Secondary from Fall River to where it connects to the New Bedford Main Line at Myricks Junction. MCRR currently operates on this line three days per week.

- **Attleboro Secondary—**CSX has an active freight railroad operation on the MassDOT owned Attleboro Secondary lines from Weir Junction to the NEC. CSX operates on this line five days per week.

The construction sequencing for the track construction would allow freight operations to be maintained throughout the majority of the track construction activities. Freight operations on the New Bedford Main Line and Fall River Secondary currently operate at a low frequency schedule. The construction activities would occur in small segments so the contractor can ensure that existing freight activities are maintained.

Certain segments of the existing Stoughton Line have active MBTA commuter rail and freight service that would need to be maintained during construction activities to construct a new second track. Construction would be similar to double track construction where freight lines currently operate.

However, due to the higher frequency of commuter rail service during the morning and evening peak periods (higher than the freight service), construction activities would be restricted during those times to minimize service impacts. It is assumed that freight deliveries can occur during the week and the corridor would be available for any construction activity for the entire weekend (Friday night through Monday morning), as there is currently no passenger service on the weekend. The following sections summarize the construction sequence.

Single Track Sections

In proposed single track sections, work must be staged to maintain passenger and freight traffic during the construction period. The general sequence of work in single-track sections would be as follows:

- Construct retaining walls and earthworks to the extent possible without affecting existing track.
- Construct bridges in the recommended phasing as outlined in Section 3.2.19.5, Construction of Bridges and Culverts, in order to maintain passenger and freight service.
- Install culverts while the track is temporarily out of service, both precast concrete box and pipe culverts. Many new culverts would be an extension of existing culvert structures.
- Construct new track in final position. Construction would be coordinated with passenger and freight service since existing track would be removed and existing ballast excavated in order to install the new track structure; temporary connections to existing tracks would be provided at limits of work segments.

Double/Triple Track Sections

In proposed double and triple track sections, the new track can be constructed without significantly disturbing the existing track, facilitating the construction of the new track structure while maintaining passenger and freight service on the existing track during construction. The existing track would be reconstructed after the new second track is constructed. The general sequence of work would be as follows:

- Construct retaining walls and earthworks to the extent possible without affecting existing track.
- Construct bridges in the recommended phasing as outlined in Section 3.2.19.5, Construction of Bridges and Culverts, in order to maintain passenger and freight service.
- Construct second track and third track (where proposed) in final position while maintaining passenger and freight operations on the existing track. The existing freight track may need to be realigned in some segments to allow space for construction of the new track structure on its proposed alignments.
- Construct turnouts at ends of double-track section. It is assumed that turnouts can be constructed while the track is out of service (i.e., overnight or during weekends).
- Shift passenger and freight service to completed second track.
- Construct remaining portions of abutments and bridges.

- Reconstruct first track in final position.

3.2.19.2 Track Construction – Stoughton Alternative

This section describes the track construction required for the inactive right-of-way of the existing Stoughton Line and the grade-separated crossing at Route 138.

Stoughton Line

The inactive Stoughton Line segment of the corridor is an existing railroad right of way that connects the Dean Street area in Taunton and the existing Stoughton Line at Stoughton Station. Construction can proceed unimpeded by active service. Construction would be similar to the single and double track construction as outlined in Section 3.2.19.1, subsection on Track Construction on Active Rail Lines.

Route 138 Crossing

The Route 138 crossing in Raynham is recommended for grade separation due to the high traffic volume on Route 138 and severe skew angle of the crossing. After analysis of several options, the preferred design would depress the railroad under Route 138. Since the profile of the railroad cannot exceed a 3 percent slope and the topography is very flat in this area, a boat section and retaining walls would be required for approximately 600 feet on either side of the underpass to depress the railroad into a cut section.

3.2.19.3 Track Construction—Whittenton Alternative

New track construction would be required on the inactive Whittenton Branch between Raynham Junction and Whittenton Junction. This segment of the corridor would be a new railroad on an abandoned right-of-way and would connect the Attleboro Secondary in Taunton to the Stoughton Line in Raynham. Construction can proceed unimpeded by active service. Construction would be similar to the single track construction as outlined in Section 3.2.19.1, subsection on Track Construction on Active Rail Lines.

3.2.19.4 Construction of Stations and Layover Facilities

Both rail alternatives include the construction of ten new stations and two new overnight layover facilities, as well as modifications to two existing stations. Work at Canton Center, Easton Village, Battleship Cove, King’s Highway, and Whale’s Tooth Stations would be predominantly platform construction. More substantial construction would be needed at Stoughton, North Easton, Raynham Park, Taunton (Stoughton Alternative), Dana Street (Whittenton Alternative), Taunton Depot, Freetown, and Fall River Depot Stations as well as the Weaver’s Cove East and Wamsutta layover facilities. The general sequence of work would be:

- Prepare the site including the placement of trailers, equipment, and supplies;
- Place erosion and sedimentation controls;
- Begin earthwork including construction of water quality management structures;
- Relocate existing utilities and place new utilities;
- Survey land and layout the site;

- Construct buildings, platforms, pedestrian overpasses, sidewalks, roadways, and parking lot;
- Construct tracks as described in Section 3.2.19.1, Track Construction;
- Construct catenary structures and signal systems; and
- Clean up the site.

3.2.19.5 Construction of Bridges and Culverts

Many of the existing undergrade (railroad) bridges along the New Bedford Main Line, Fall River Secondary, Attleboro Secondary, and Stoughton Line do not meet current design standards for commuter rail service. In order to accommodate the requirements for the commuter rail alternatives, the bridges would be rehabilitated or replaced as described in Section 3.2.11, Bridges and Culverts. Since the majority of the existing freight and passenger service must be maintained during construction activities, the proposed undergrade bridge improvements would be constructed and staged to allow the passage of trains while they are under construction. The construction staging strategy is especially important where bridges are over environmental resource areas like rivers and wetlands to minimize impacts to these resources.

In some cases, the overhead (highway) bridges would need to be reconstructed to increase the railroad vertical or horizontal clearance under the bridge. However, if existing vertical and horizontal clearances are sufficient, overhead bridges would not be modified.

For all undergrade bridges, the majority of the work area would be limited to the area behind the existing abutments. Only during erection of the superstructure would work be done over existing roadways or waterways. This phase of construction must be coordinated with local and state officials and would follow an accepted traffic management plan for bridges over roadways.

For bridges over waterways, the contractor would ensure that all construction is performed within the temporary and permanent impact limits set forth by the environmental permits. Any dewatering, if required, would also be performed in accordance with the environmental conditions. No debris would be allowed to enter the watercourse. For longer spans over watercourses, particularly the Taunton River, it may be necessary for the work to be done using barges. The three Taunton River bridges on the Stoughton Line and the Cedar Swamp River bridge on the Fall River Secondary would be constructed while the tracks are out of service or during temporary track shutdowns since constructing temporary bridges would have a significant impact on the environmental resources at these locations.

For construction in areas where the track is active, the construction must be properly phased so that service is not interrupted. In order to maintain service, support of excavation and of the track may be necessary. All work would be coordinated with the railroad and accepted prior to construction. For all bridges, any demolition materials would be removed from the site and properly disposed of off-site. For construction of the three Taunton River bridges on the Stoughton Line, it is assumed that the existing track would be taken out of service for a period to construct the new bridges to minimize impacts to the river.

Construction sequencing is an important consideration at railroad bridges where active rail must be maintained. For track segments without active rail service, or with rail service which can be deactivated, construction on undergrade bridges can proceed unimpeded. At locations where rail service must be

kept active, bridge staging would generally be similar to one of the schemes described below depending on the number of tracks the existing structure can accommodate and the number of tracks being proposed over the crossing. Structural staging may be affected by track staging along the alignment, staging requirements of nearby structures, and property or wetland boundaries. For more details on construction staging of the bridges, refer to the Construction Staging Memorandum, included as Appendix 3.2-F.

For culverts that would remain in place, the existing culverts would be extended to accommodate the wider rail bed. The culvert extensions would be installed before the slope embankment is modified for the new track structure. At each location, the inlet could be sand bagged to temporarily stop the flow of water and pumps can be used to divert the flow for construction of the culvert end base of gravel and stone in the dry. The pipe extensions would be fitted to the existing culverts and stone pads installed to minimize erosion at the culvert ends.

For construction of new culverts to replace existing culverts, the typical sequence of construction would be to excavate above the slab and behind the abutment walls of the existing culvert. The inlet could be sand bagged to stop the flow of water and pumps can be used while constructing the new gravel and stone foundation in the dry. After the foundations are constructed a precast concrete box culvert and cast-in-place headwalls can be installed. For more details on construction staging of the culverts, including a list of culverts, refer to the Construction Staging Memorandum, included as Appendix 3.2-F.

3.2.19.6 Construction of Grade Crossings

Grade crossing improvements would be constructed with construction work zones that may require temporary travel lane closures and/or lane width reductions. The majority of the work would be performed while maintaining vehicular and rail traffic during construction activities. Existing grade crossing equipment would be removed and new equipment installed in place. A list of grade crossings can be found in the Construction Staging Memorandum, Appendix 3.2-F.

3.2.19.7 Construction of Electrification Systems

Construction for the electric commuter rail alternatives includes constructing a new electrification system and connecting to the existing electrification system on the NEC at Canton Junction. Diesel alternatives would not require this infrastructure. Section 3.2.14 of this chapter describes the proposed electrification system.

New electrification infrastructure would be required for the electric commuter rail alternatives south of where the route diverges from the NEC in Canton.

The new electrification infrastructure would include traction power facilities and an OCS as well as modification to the signal system to make it compatible with electrified rail service. Since operations would utilize part of the electrified NEC, the project would use a similar system.

The traction power system providing power to the OCS is made of three different types of traction power facilities: Traction Power Substation, Switching Station, and Paralleling Station.

The Stoughton and Whittenton Alternatives electrification system would consist of two main substations, two switching stations, and six paralleling stations.

Each traction power facility would include:

- Switchgear
- Transformers (main traction power and autotransformers)
- Protection relaying & controls
- Disconnect switches (structure mounted)
- Auxiliary transformers and power systems
- Grounding and Bonding System
- SCADA Equipment

The traction power substation is the largest type of facility and requires a high voltage (115 kV) utility power interface to provide power to the rest of the system. Switching stations and paralleling stations are smaller facilities that do not require a high voltage utility supply.

The traction power facilities would be adjacent to the existing right-of-way, so construction could be staged with little or no impacts to the existing train service. Typically, the construction of each site would proceed independently early in the overall construction process. The main substations are more complex and construction would be started as early as possible. Once construction is complete, each substation would be tested and energized prior to completion of the OCS and other systems.

The OCS consists of concrete foundations, steel poles, contact wire, feeder wire, static wires and sectionalizing switches. It is largely dependent on the track installation. Therefore, the OCS would typically be installed after the track is in place. OCS pole foundations are set with respect to the center of the track. Poles are typically placed a minimum of 10 feet from the track centerline, which is within the track right-of-way. Pole footings would be installed using off track equipment during times when no train service is operating to minimize impact to existing operations. In areas where access along the right-of-way is limited, excavation for the foundations would be completed by on-track equipment. This would have more impact on rail operations, especially in single track areas, and may be restricted to nights or weekends. Precast foundations could be used to reduce the installation time. In areas where there is no existing service, construction could proceed more quickly, as construction would not be restricted by operations.

After the foundations are in place, the catenary poles would be erected. Pole mounted steel work (cantilevers, drop tubes, disconnect switches, etc.) would then be installed. With the steel and poles in place, the OCS conductors would be strung, tensioned and anchored, hangers installed, clipped in place and registered. This work would all be done during foul time or track out-of-service using on or off track, space permitting. Once a section is complete, cable connections, wire terminations, and jumpers would be installed.

The system would not be energized until all signal and communications systems were fully installed and operational, to ensure that all remote monitoring and control facilities were working correctly.

The wayside power system requirements are set with respect to the track alignment and location of equipment at interlockings. Therefore, the wayside power cubicles, required to remotely control and

operate the OCS sectionalizing switches and control interlocking lighting, would be installed at the same time as the OCS.

3.2.20 Ridership

In order to estimate future ridership projections for the South Coast Rail alternatives in greater detail, the Central Transportation Planning Staff (CTPS) refined their regional travel demand model set to include regional transportation projects, land use alternatives based on regional plans for the study area, and the proposed operation plans for the alternatives.

The ridership analysis of the DEIS/DEIR was updated for the FEIS/FEIR using an updated version of the CTPS travel demand model. The analysis took into account the results of the 2010 Census, changes to the No-Build condition projects, and changed the analysis year from 2030 to 2035.

3.2.20.1 Model Basis

The CTPS model used a modeling process consistent with those of other major transportation projects in eastern Massachusetts. This travel demand model was refined specifically for the South Coast Rail study area, utilizing the current Boston region MPO travel model and the statewide model for the south coast rail study area. The model set that CTPS uses for forecasting travel demand is based on procedures and data that have evolved over many years and incorporated assumptions based on accepted practice, professional judgment and policy decisions relating to items such as model method, service plans and demographic assumptions. This modeling method allowed for a consistent comparison of the alternatives based on their projected ridership. The CTPS regional model and its underlying assumptions are subject to review and approval by FHWA and FTA because the model is used to develop the regional emissions estimates used for transportation conformity determinations on the long-range transportation plan and transportation improvement program.

The basis for the CTPS model is summarized below, with supporting technical information provided in Appendix 3.2-G. (prepared in 2009). Updates to the CTPS model incorporated for the FEIS/FEIR analyses are discussed in Appendix 3.2-H.

Existing Transit Modes

Connectivity to other transit modes provides a larger coverage area for the project while it increases mobility and regional opportunity. The model includes all of the major transit modes, such as commuter rail lines, the subway system (including both light and heavy rail lines), ferry service, and bus routes in regional communities. The model allows for transfers between all of these modes. Access to the transit system is allowed via walk/bike, transit, park-and-ride, and kiss-and-ride modes.

Regional Plan

The demographic forecasts were created by the local Regional Planning Agencies (RPAs) in the model area such as the Southeastern Regional Planning and Economic Development District (SRPEDD), Old Colony Planning Council (OCPC), and Metropolitan Area Planning Council (MAPC) for use in their most recently adopted Regional Transportation Plan (RTP). The land use assumptions do not include the possible casino developments. The transportation improvements included in this study are those highway improvement projects most likely to be built by 2035 and are included in the last federally approved and fiscally constrained Regional Transportation Plans in the model area. This includes the

major transit projects assumed in the State Implementation Plan (SIP) and included in the Boston Region RTP, such as:

- Green Line Extension Project
- Fitchburg commuter rail improvements
- Assembly Square, Orange Line Station
- Fairmont commuter rail station improvements
- 1,000 additional parking spaces throughout the commuter rail system

Other transportation projects assumed in the analysis are based on the SRPEDD and the OCPC Regional Transportation Plan Highway Improvements Projects.

Ridership forecasts were developed for all alternatives for the 2035 forecast year. For the No-Build (Enhanced Bus) Alternative, the ridership model assumes enhancements to the existing commuter bus service. For the Build Alternatives, the ridership model assumed that the transportation network would be updated to reflect the project improvements and the model was re-run for the various options. The outputs of these model runs were compared to the No-Build Alternative to see what changes in travel patterns would occur to the transportation system due to the South Coast Rail alternatives.

Population and Employment Densities

To establish where people are coming from and going to, the travel demand / ridership model takes into account the population and employment densities of the region. This is the basis for an origin/destination summary that ultimately translates into the number of people who would use the rail or bus alternatives. The model also accounts for the proximity of population densities to establish how the riders access the stations. Knowing whether riders walk, bike, drive or take the bus, for instance, is also relevant to ensure that the stations are properly designed with adequate sidewalks, bike storage capacity, parking capacity, and good connections to other transit modes.

3.2.20.2 Ridership Model Inputs

The travel demand model relies on the following elements and assumptions to estimate future ridership projections:

- Operating Plan
- Station Locations
- Station Parking, Availability and Cost
- Fares

These elements are discussed below.

Operating Plan

The operating plan for the travel demand model was developed using minimum acceptable service assumptions based on the MBTA Service Delivery Policy. Rail travel times for the Stoughton/Whittenton Alternatives, which include dwell times at the stations, were calculated for the 2035 operation and reflect future improvements and service modifications to the rail corridors.

The operating plan includes 30 minute peak period peak direction service along the Fall River Secondary and New Bedford Mainline. Peak period peak direction headways would be approximately 18 minutes on the portion of the alignment north of Myricks Junction.

Station Locations

How well a transit alternative appeals to potential riders is directly related to how easily patrons can get to a station. The travel demand model, therefore, takes into account the surrounding transportation infrastructure and any barriers that make access to the station difficult, which could potentially add to the in-vehicle travel time to the stations.

Station Parking, Availability and Cost

In order to plan for and design station parking that accommodates future demand, the majority of proposed stations were modeled as if there were no constraints on the amount of available parking. Running the model unconstrained at the proposed stations ensures that the true attractiveness of a station would be reflected in the total number of riders who would be expected to use the new service. This applies to the riders who would arrive to the station by car. All other modes (i.e. patrons arriving to the station by walking or riding a bicycle) would be unaffected by the parking supply. Stations that do not offer parking were modeled without parking. Parking constraints were applied at Taunton station where the desire to accommodate future transit-oriented development (TOD) was a driving factor. Stations where TOD is projected would limit the parking supply to the benefit of greater development intensity in the immediate vicinity of the station to encourage future transit riders to live and work within walking distance of the station.

Fares

The model also considers the economics of using the proposed transit system. This allows the model to weigh the economic attractiveness of riding the proposed system compared to the economics of continuing to drive or using the existing commuter bus service. Fares for the No-Build Alternative were based on the existing commuter bus monthly fare structure; fares for the Build Alternatives including both the rail and bus alternatives were based on the current MBTA commuter rail monthly fare structure.

3.2.20.3 Ridership Modeling Results

Overview

For the purpose of portraying the ways in which the South Coast Rail project shifts and adds new ridership, the results presented are new transit trips at the proposed South Coast Rail project stations, new linked-trips, new system-wide trips and the total reduction in vehicle miles travelled (VMT).

A summary of new station boardings pertains to the new South Coast Rail stations only and gauges the overall benefit to the region provided by each alternative.

The total number of linked trips per alternative represents the shift in mode choice due to a South Coast Rail project alternative. For instance, for mode of access, residents of the South Coast communities currently have few options outside driving to work. With the South Coast Rail project, people would have regional transit opportunity, which was previously not available, giving South Coast residents an additional mode by which they could get to work. The additional transit choice presented by the project would increase the number of people who would choose to take transit to work. This number is represented in the linked trips increase and represents the number of people who, without the project, would have otherwise driven to work.

New system-wide boardings represent the overall draw to the commuter rail transit system due to the South Coast Rail project, which represents an increase in capacity along other commuter rail lines as a particular alternative attracts system-wide new ridership. This total is also used to calculate overall cost-effectiveness of the project.

The VMT measure quantifies how many miles of auto travel would be removed from the region due to the project. As people switch from driving to using the new transit project, the reduction in VMT correlates to air quality benefits due to the project.

The CTPS modeling for the FEIS/FEIR included updated demographic data for 2035 and newer information on future year background transportation projects that are consistent with the Long Range Transportation Plans (LRTP) of the Metropolitan Planning Organizations (MPOs) in the study area.

The base year, No-Build, Stoughton Electric and Whittenton Electric Alternatives were assessed using the CTPS regional travel demand model. The Stoughton and Whittenton Diesel Alternatives were examined using an elasticity based method that took into account the electric variant modeling results and the effect of the slower travel time of the diesel alternatives compared to the electric alternatives. Elasticities were used since the diesel operating plans mirrored those of the electric options, except for travel time. It is an accepted practice in the transportation planning profession to use elasticities when only one service plan variable changes, such as travel time.

The No-Build assumes land use changes and the transportation projects included in the LRTP, and existing private bus service from New Bedford, Fall River, and Taunton into Boston. The No-Build also improves the frequency of the private bus operations serving the South Coast rail Study area.

The performance metrics examined, include linked and unlinked transit trips by mode, station boardings in the study area and VMT.

Ridership

An overview of changes in ridership among the alternatives conducted for the DEIS/DEIR and the FEIS/FEIR is presented in Table 3.2-23. The FEIS/FEIR results differ from the DEIS/DEIR in several ways. The base year was updated from 2006 to 2010. The forecast year was extended out to from 2030 in the DEIR to 2035 in the FEIS/FEIR. The list of transportation projects in the LRTP is also significantly different. The DEIS/DEIR included the Urban Ring Phase II, the Silver Line Phase III connection, and a host of other projects that are not included in the most current fiscally constrained LRTP. The land use is another important change. The 2030 forecasts were developed with an eye towards a lot of population growth in the suburbs and employment growth in the major cities, like Boston and Taunton in the study area. Given the current economic climate, the 2035 forecasts have been scaled back in absolute numbers, along with a more targeted smart growth approach. The FEIS/FEIR service plans for the Stoughton

Electric and Whittenton Alternatives also differ slightly from those used in the DEIS/DEIR, being more refined and the FEIS/FEIR now includes a feeder bus network that complements the proposed stations.

Table 3.2-23 Ridership of Alternatives (DEIS/DEIR and FEIS/FEIR)

	DEIS Stoughton Electric	FEIS Stoughton Electric	DEIS Whittenton Electric	FEIS Whittenton Electric
Battleship Cove	210	240	200	200
Downtown Taunton/Dana Street	n/a	n/a	890	320
Easton Village	320	150	320	150
Fall River Depot	740	840	640	750
Freetown	240	180	160	160
King's Highway	460	520	390	480
North Easton	750	460	750	490
Raynham Park	550	430	600	520
Taunton	510	670	n/a	n/a
Taunton Depot	410	400	360	360
Whale's Tooth	600	680	510	610
Total Station Inbound Boardings	4,790	4,570	4,820	4,040
Total Reduction in VMT (compared to No-Build (Enhanced Bus))	295,900	-255,932	228,000	-201,232

All of these changes led to demand estimates in the FEIS/FEIR that are between 10 and 20 percent lower for the Build Alternatives than were estimated in the DEIS/DEIR. The most significant change is the land use assumed in 2035, which drives the trip making from population locations (South Coast Rail Study area) to employment centers, namely Boston and Cambridge. The change in station location from Downtown Taunton to Dana Street also substantially reduced ridership of the Whittenton Electric Alternative compared to the DEIS/DEIR.

Transit Metrics

The four key transit metrics presented in Table 3.2-24 consist of daily linked transit trips, daily unlinked trips, boardings on the commuter rail system, and boardings on the private buses serving the study area compared to the True No-Build scenario. Detailed breakdowns of the system-wide transit results are included in Appendix 3.2-H.

The transit system grows from 1.27 million unlinked transit trips in 2010 to 1.61 million in 2035 if there are no improvements to the transportation system other than what was included in the LRTP. The growth in unlinked transit trips is primarily due to demographics, but some transit improvements such as the Green Line Extension, Assembly Square Orange Line Station, and the new Fairmount Line Stations are adding to the increase in transit trips in the future.

The enhanced bus service under the No-Build Alternative represents a slight improvement of the private bus system and this adds 2,210 unlinked transit trips to the system daily. The Stoughton Electric option adds 7,100 unlinked transit trips compared to the No-Build/Enhanced Bus, while the Whittenton Electric option adds 6,000 unlinked trips.

Table 3.2-24 2035 Regional Transit Modeling Results (Daily)

Year / Scenario	2010 Existing Conditions	2035 True No-Build	2035 No-Build / Enhanced Bus	2035 Stoughton Electric	2035 Whittenton Electric	2035 Stoughton Diesel	2035 Whittenton Diesel
Unlinked Transit Trips	1,270,700	1,612,000	1,614,210	1,621,310	1,620,210	1,621,010	1,620,010
Difference with No-Build/Enhanced Bus	na	-2,210	na	7,100	6,000	6,800	5,800
Linked Transit Trip	1,018,000	1,294,400	1,296,300	1,301,800	1,301,000	1,301,500	1,300,650
Difference with No-Build/Enhanced Bus	na	-1,900	na	5,500	4,700	5,200	4,350
Commuter Rail (1)	145,000	178,200	177,710	188,010	187,110	187,460	186,660
Difference with No-Build/Enhanced Bus	na	490	na	10,300	9,400	9,750	8,950
Study Area Private Buses (2)	1,600	4,100	6,000	1,100	1,200	1,250	1,350
Difference with No-Build/Enhanced Bus	na	-1,900	na	-4,900	-4,800	-4,750	-4,650

(1) Commuter system calibrated to conductors counts

(2) Study area means the South Coast Rail project study area

There are two reasons the Whittenton Electric option has less demand than the Stoughton Electric option:

- The service plan for the Whittenton Electric option has slower travel times from the southernmost stations to South Station than the Stoughton Electric option.
- The Whittenton Electric option has a different stop pattern in Taunton, which causes the additional travel time.

The diesel options for the Stoughton and Whittenton Alternatives have slower travel times into Boston from New Bedford, Fall River, and Taunton, resulting in less demand relative to their electric options. The Stoughton Diesel option has 6,800 more unlinked trips than the No-Build, 300 less than the electric option. The Whittenton Diesel option has 5,800 more unlinked trips than the No-Build, 200 less than the electric option.

The daily system wide linked transit trips grows from 1.02 million 2010 to 1.29 million in the 2035 No-Build scenario. The enhanced bus service to the No-Build Alternative provides a small improvement, adding 1,900 daily linked transit trips.

The Stoughton Electric adds 5,500 more linked transit trips and the Whittenton Electric option adds 4,700 daily linked transit trips relative to the No-Build/Enhanced Bus Alternative. The Stoughton Diesel option has 5,200 new linked transit trips and the Whittenton Diesel option 4,350 new linked transit trips relative to the No-Build. The reasons for these differences are the same as for the unlinked transit trips described above.

The No-Build/Enhanced Bus Alternative causes a decrease in commuter rail boardings, by 490. This option adds bus service in the study area, which siphons off commuter rail riders from the Providence, Stoughton, and Middleborough commuter rail lines. The Stoughton Electric option adds 10,300 boardings daily to the commuter rail system and the Whittenton Electric option adds 9,400 boardings daily to the commuter rail system relative to the No-Build/Enhanced Bus. The Stoughton Diesel option adds 9,750 boardings and the Whittenton Diesel option adds 8,950 boardings relative to the No-Build. This is between 450 and 550 lower than their corresponding electric options.

The private bus system in the study area had 1,600 daily boardings in 2010, but is forecasted to grow to 4,100 in 2035 without any service improvements (primarily due to population and employment growth and demographic trends increasing transit usage). The No-Build/Enhanced Bus Alternative improves the private bus service in the South Coast rail corridor by adding frequency and this increases ridership to 6,000, an increase of 1,900 boardings. The Stoughton Electric option has 1,100 and the Whittenton Electric option 1,200 private bus trips relative to the No-Build/Enhanced Bus. The Stoughton Diesel option has 1,250 private bus trips and the Whittenton Diesel option 1,350 new private bus trips relative to the No-Build/Enhanced Bus. This is about 150 boardings more than the corresponding electric options.

Conclusion

The results of this analysis show that the Stoughton and Whittenton Electric options both capture a significant number of trips, between 4,700 and 5,500, respectively, on a daily basis in 2035 relative to the No-Build/Enhanced Bus scenario that would have otherwise been made by auto. This translates into a VMT savings, Vehicle Hours Traveled (VHT) reduction, and emissions benefits, which are discussed in

Chapter 4.9, *Air Quality*.[16] The major difference between the two commuter rail alternatives are travel times for trains traveling the outer stations, south of Taunton, into Boston. The longer travel times from New Bedford and Fall River up through Taunton in the Whittenton Electric option reduces demand at these stations.

The stations in Taunton also see a reduction in the Whittenton Electric option, but drive access demand increases at Raynham Park Station, due to people willing to bypass the slower segment of train travel and pick up the line north of the delay during the AM time inbound commute. These results show the same pattern as observed in the DEIR for the electric options, although they are showing less demand. This is primarily a function of the most current RPA adopted land use assumptions in the model area and represents a more conservative view of future smart growth strategy consistent with the South Coast Rail Corridor Plan.

In general, the electric options attract more riders than the diesel options due to the faster travel times, which is a function of faster acceleration of the electric technology being used by the locomotives.

However, regardless of the technology, electric or diesel, the Stoughton Alternative consistently attracts more riders than the Whittenton Alternative especially for trips south of Taunton, where additional travel time is needed to traverse the Whittenton Junction. The travel time difference between the Stoughton and Whittenton Alternatives is a more significant factor in attracting riders than the travel time differences associated with the technology, diesel versus electric.

3.3 EVALUATION OF FEIS/FEIR ALTERNATIVES

This section provides an overview of the performance of the alternatives with regard to achievement of the project purpose, their practicability and their environmental impacts, in particular with regard to aquatic resources. The following alternatives are analyzed in this FEIS/FEIR:

- No-Build (Enhanced Bus) Alternative
- Stoughton Electric Alternative
- Stoughton Diesel Alternative
- Whittenton Electric Alternative
- Whittenton Diesel Alternative

The characteristics of the above alternatives are described in Section 3.2. The analysis of their impacts in detail is presented in Chapter 4. Chapter 7 provides a summary of the mitigation commitments incorporated into the project.

This section summarizes and compares the characteristics of the Build Alternatives analyzed in this FEIS/FEIR and is a continuation of the alternatives screening process that began prior to the DEIS/DEIR. The discussion includes a set of evaluation criteria that are consistent with the evaluation criteria utilized in the earlier stages of alternatives screening, but more refined in consideration of the more

[16] The air quality analysis shows that the technology drives the benefits. Electric technology provides substantially more emissions savings than the diesel options and the TSM alternative when the transit vehicle emissions are combined with the passenger vehicle emissions being saved.

detailed level of information available and taking into consideration the comments on the DEIS/DEIR. Specific screening criteria were refined from the earlier stages of the alternatives analysis based on operational and environmental issues. The earlier analysis criteria were expanded with subcriteria to include a more detailed evaluation of how well the alternatives would meet the project purpose, whether or not they are practicable to construct and operate, and the magnitude of their environmental impacts and/or benefits.

The results of the evaluation process are used to reach a conclusion regarding the least environmentally damaging practicable alternative (LEDPA) for the South Coast Rail project. As explained in Section 3.3.4, USACE has concluded the Stoughton Electric Alternative is the LEDPA and has identified the Stoughton Electric Alternative as the preferred alternative under NEPA.

3.3.1 Project Purpose

This section evaluates the alternatives that advanced to the FEIR/FEIS with regard to the overall project purpose "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts to enhance regional mobility. The following aspects were considered in the evaluation. The Build Alternatives were compared against the No-Build Alternative as well as with each other.

- Ridership demand – This aspect relates to meeting the demand for public transportation.
- Improve quality of service – This aspect evaluates how well each alternative provides a transit trip that is competitive to travel by car and meets MBTA's Service Delivery Policy.
- Reduce vehicle miles traveled – This aspect evaluates to which extent each alternative provides public transit connections between New Bedford/Fall River and Boston that offers the opportunity to shift from auto mode reliance to using the transit mode.
- Improve regional mobility – This aspect evaluates the extent to which each alternative provides public transit connections between New Bedford/Fall River and Boston and provides public transit connections between South Coast cities (New Bedford, Fall River, Taunton and others).

3.3.1.1 Ridership Demand

The Build Alternatives are predicted to result in 3,930 to 4,570 daily boardings at the new stations (see Table 3.3-1). Private bus service boardings under the Build Alternatives would decline substantially to 1,100 to 1,350 (compared to 6,000 in the 2035 No-Build condition) as a result of the diversion of passengers to the new rail options. When the rail ridership and remaining bus ridership are considered together, the Build Alternatives would meet 65.5 to 71.0 percent of the demand for approximately 8,000 work trips from the South Coast region to Boston.

Due to a faster travel time to Boston, the Stoughton Alternatives achieve greater ridership in the Southern Triangle than the Whittenton Alternatives. For example, the Stoughton Electric would have 840 daily boardings at Fall River Depot compared to 750 under the Whittenton Electric Alternative.

The Whittenton Alternatives ridership is also less than the Stoughton Alternatives because the Whittenton alignment does not include the Taunton Station, which has 670 daily boardings under the Stoughton Electric Alternative. The Whittenton Alternative station closest to downtown Taunton (Dana

Street) has substantially lower ridership (320 daily boardings under the electric alternative). The Whittenton Electric Alternative boardings at Raynham Park (520) would be higher than under the Stoughton Electric (430). This is because under the Whittenton Alternative, the Raynham Park Station would be more convenient to some commuters than would Dana Street; however, under the Stoughton Alternative, the Taunton (Dean Street) station would in theory be more convenient to those same commuters than would Raynham Park.

Table 3.3-1 Daily Ridership Demand by Alternative (2035)

Name	New Rail Station Boardings[2]	Boardings at Existing Commuter Bus Services	Total Service to South Coast Region	Percentage of Met Ridership Demand [1]
No-Build (Enhanced Bus) Alternative	na	6,000[3]	6,000	75.0%[3]
Stoughton Electric Alternative	4,570	1,100	5,670	70.9%
Stoughton Diesel Alternative	4,430	1,250	5,680	71.0%
Whittenton Electric Alternative	4,040	1,200	5,240	65.5%
Whittenton Diesel Alternative	3,930	1,350	5,280	66.0%

1 Total Service to South Coast region divided by the number of daily work trips from the South Coast region to Boston (approximately 8,000)

2 Relocated Stoughton Station not considered "new" for purposes of calculating new boardings

3 This is an artifact of the model; whether such private bus service would actually occur is uncertain. Future private bus operations would be far less attractive due to increased travel time but because travel time would still be better than by car and there would be no alternative it would absorb the demand in the model.

The difference in ridership between the electric and diesel versions of the alternatives is small, with the diesel alternative rail ridership at new stations being approximately three percent lower than the corresponding electric alternative due to slightly longer travel times. Despite having lower rail ridership, the Stoughton Diesel Alternative has the highest total service to the South Coast Region when considered together with bus service (although the difference from the electric version is negligible—10 boardings).

Travel Time

Since New Bedford/Fall River commuters currently rely on cars and private bus services, an improved quality of service would provide a comparable or competitive travel time and improved reliability with respect to existing commuter options during peak commuting periods. The average commuting time by car during rush hour is currently 90 minutes. The CTPS travel demand model projects slower commutes as congestion along already slow corridors continues to increase. A future (2035) commute from New Bedford and Fall River to Boston is expected to be approximately 10 to 30 minutes longer than in 2009 (in the peak period).

Travel time for the rail alternatives was based on operational analyses, which identified the segments of the rail corridors that would operate at top speed as well as segments where speed is constrained due to speed restrictions, geometry, vehicles, power mode, dwell times and number of stations and civil restrictions. Each commuter rail alternative has two overall run times: one for electric locomotives and one for diesel locomotives, as maximum speeds under the electric alternatives are greater than under diesel alternatives.

The Stoughton Electric Alternative achieves the fastest travel times (77 minutes between New Bedford and Boston during the peak period). The Stoughton Diesel Alternative takes approximately 5 minutes

longer than the electric alternative to travel the same route because of the additional time diesel locomotives need to accelerate from the stations. Travel times are presented in Table 3.3-2.

Table 3.3-2 Average Travel Times by Alternative (New Bedford to South Station Peak Period)

Name	Travel Time (min)
No-Build (Enhanced Bus) Alternative	100
Stoughton Electric Alternative	77
Stoughton Diesel Alternative	82
Whittenton Electric Alternative	84
Whittenton Diesel Alternative	89

The longer route of the Whittenton Electric Alternative results in a total travel time approximately seven minutes longer than the Stoughton Electric Alternative (84 minutes compared to 77 minutes). The Whittenton Diesel Alternative takes 5 minutes longer to travel from New Bedford to Boston than the Whittenton Electric Alternative and has the longest travel time of the rail alternatives.

Service Delivery Policy

While an alternative might offer benefits for the transit system in the South Coast region, it may be an unattractive service for the communities it is designed to serve because it offers too few trips. In order to maintain acceptable service, the MBTA has established a Service Delivery Policy[17] to ensure it provides quality transit services that meet the needs of the riding public. The minimum frequency of service levels provides the guidelines by which the MBTA maintains accessibility to the transportation network within a reasonable waiting period. The minimum frequency of service standards is the minimum frequency that must be maintained in a service. Commuter Rail and Commuter Bus minimum frequencies should provide 3 trips in a peak direction during the AM and PM peak periods.[18]

The Stoughton and Whittenton Alternatives (electric and diesel variants) would all meet the minimum service delivery policy standard. The No-Build Alternative would not meet this standard.

3.3.1.2 Vehicle Miles Traveled

VMT is an important gauge for an alternative's transportation system benefits. VMT measures the extent of motor vehicle operation or the total number of vehicle miles traveled within the study area on given day. This particular measure quantifies how many miles of travel would be removed from the regional roadway network by commuters who elect to travel by train or bus rather than drive. This reduction in driving has several environmental benefits, notably, cleaner air and a reduction in greenhouse gas emissions. Fewer cars on the road also eases congestion along highway corridors.

Table 3.3-4 summarizes the daily reduction in VMT provided by each alternative based on updated CTPS projections for 2035 (Appendix 3.2-H).

The Stoughton Electric Alternative achieves the greatest reduction in daily VMT of all the alternatives, approximately 54,700 VMT per day greater than the Whittenton Electric Alternative. The Stoughton Diesel Alternative has the second greatest VMT reduction, approximately 6.5 percent less than the

[17] Massachusetts Bay Transportation Authority, Service Delivery Policy, MBTA Board of Directors approved January 14, 2009.
[18] Between LIRR, MNRR, MBTA, and METRA, the average service provided is 2.9 peak period trains.

Stoughton Electric Alternative. With the longest travel time and lowest ridership, the Whittenton Diesel Alternative is also the least effective of the rail alternatives in reducing regional VMT, although it still provides substantial benefits (reduction of 186,306 VMT per day).

Table 3.3-4 Regional VMT Reductions by Alternative (2035, Auto and Bus Transit)

Alternative	VMT Reduction (daily miles)
No-Build (Enhanced Bus) Alternative	0
Stoughton Electric Alternative	-255,932
Stoughton Diesel Alternative	-240,348
Whittenton Electric Alternative	-201,232
Whittenton Diesel Alternative	-186,306

1 Reduction in VMTs provided by an alternative divided by the maximum reduction of VMTs (in this case, Stoughton Electric with roughly 255,932 fewer vehicle miles traveled per day)

3.3.1.3 Regional Mobility

This section discusses the number of interregional links provided by each alternative consistent with the goal of the project to improve regional mobility. An interregional link is a link that provides a one-seat ride from one municipality to another. The Stoughton and Whittenton Alternatives generate similar benefits with regard to interregional mobility and each provides 41 interregional links. The No-Build Alternative retains existing regional mobility but does not provide many of the interregional links provided by the Build Alternatives, nor does it provide a direct link between any of the communities served by the Build Alternatives and Boston.

Table 3.3-5 highlights the interregional links provided by the Stoughton and Whittenton Alternatives.

Table 3.3-5 Interregional Links – Stoughton and Whittenton Alternatives[1]

	Boston	Westwood	Canton	Stoughton	Easton	Raynham	Taunton	Freetown	Fall River	New Bedford
Boston		X	X	X	X	X	X	X	X	X
Westwood	X		X	X	X	X	X	X	X	X
Canton	X	X		X	X	X	X	X	X	X
Stoughton	X	X	X		X	X	X	X	X	X
Easton	X	X	X	X		X	X	X	X	X
Raynham	X	X	X	X	X		X	X	X	X
Taunton	X	X	X	X	X	X		X	X	X
Freetown	X	X	X	X	X	X	X		X	
Fall River	X	X	X	X	X	X	X	X		
New Bedford	X	X	X	X	X	X	X			

1 Inter-municipal connections not included.

3.3.1.4 Summary

The No-Build (Enhanced Bus) Alternative does not meet the project purpose and need nor its goals and objectives. All Build Alternatives meet the purpose and need. Among them the Stoughton Electric Alternative best meets the project's goals and objectives as reflected in the aspects discussed above.

The Stoughton Diesel Alternative and the Whittenton Electric Alternative follow closely behind, generally performing well in meeting the goals and objectives, although to a lesser degree than the Stoughton Electric Alternative. The Whittenton Diesel Alternative performs the worst relative to the other Build Alternatives.

3.3.2 Practicability

This section describes the practicability of construction or operation for each of the proposed alternatives analyzed in this FEIS/FEIR.

Section 3.3.1 documented how each of the Build Alternatives meets the project purpose. The discussion below provides data on how practicable each of the alternatives would be to implement based on the Permit 404 definition of practicable: "capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose." Four sub-criteria were used to evaluate how practicable the alternatives are:

- Cost per Rider– Measures how costly it would be to provide an alternative compared to the number of riders expected to use the system.
- Construction Schedule – The time required to construct each alternative is also a measure of practicability because longer construction schedules become increasingly more expensive, as well as delay the delivery of project benefits.
- On-Time Performance – Measures how well the alternatives would be able to serve the South Coast Region in terms of providing the passengers an assurance that they will arrive on time and measures how capacity constraints translate into impacts on the overall MBTA commuter rail system.

3.3.2.1 Cost Per Rider

This criterion evaluated how well an alternative performs based on how a balance of capital and operating and maintenance cost to the benefit of the service, or the number of riders projected to use the system. The metric for this criterion is cost per rider, which includes infrastructure construction, land acquisition, environmental mitigation, brownfield site remediation and other construction elements based on the more refined preliminary engineering design as well as the cost of operating and maintaining the system. A breakdown of capital cost and operation and maintenance cost estimates can be found in Section 3.2.18.

Table 3.3-6 compares the cost per rider of each alternative based on the cost estimates and the 2035 CTPS ridership projections. The Stoughton Diesel Alternative would have the lowest cost per rider, at $29.71. The Stoughton Diesel and Stoughton Electric Alternatives are more cost effective than the corresponding Whittenton Alternatives, due to the higher annual maintenance cost associated with the longer track length and lower ridership under the Whittenton Alternatives. The diesel variants of the alternatives are more cost effective than the electric variants for both the Stoughton and Whittenton

corridors because of lower capital and operating costs. It was assumed the capital cost of the diesel alternatives would be 30 percent less than the electric alternatives and operating and maintenance costs would be 3 percent less.

Table 3.3-6 Cost per Rider by Alternative

Name	Cost per Rider [1]
Stoughton Electric	\$35.28
Stoughton Diesel	\$29.71
Whittenton Electric	\$39.60
Whittenton Diesel	\$33.32

1 Annualized capital cost (over 30 years) and annual operating and maintenance cost estimates divided by 2035 annual commuter rail system passengers. CTPS daily ridership annualized assuming 260 weekdays per year.

3.3.2.2 Construction Schedule

The time required for construction affects the length of short-term impacts and the startup date for new transit services. Alternatives were evaluated to determine whether each alternative could be constructed within a reasonable, four-year, timeframe in order to achieve the project. A 4-year construction schedule has been outlined in Governor Patrick's *South Coast Rail, A Plan for Action*. In addition to trying to maintain this schedule, a shortened construction period would ensure lower construction costs. Construction costs, which typically escalate over time, would increase significantly with longer construction periods (particularly with regard to the cost of materials such as steel and concrete).

Construction schedules were established based on construction sequencing outlined in Section 3.2. Construction of track, bridges, culverts, grade crossings, electrification and whether the construction would occur along active or inactive corridors, among other components, all contribute to the construction duration required. Table 3.3-7 compares the construction schedules of the alternatives.

Table 3.3-7 Construction Schedule by Alternative

Name	Construction Schedule (years)
No-Build	0.0
Stoughton Electric	4.5
Stoughton Diesel	4.0
Whittenton Electric	4.5
Whittenton Diesel	4.0

1 Construction schedule of an alternative divided by the minimum construction time (in this case, Stoughton and Whittenton Diesel which could be constructed in 4.0 years)

All Build Alternatives would have an approximate construction schedule of 4 to 4.5 years, which is considered within an acceptable range.

3.3.2.3 On-Time Performance

While project travel time is an important initial criterion in evaluating the practicability of an alternative (as was done during the initial evaluation phases), the reliability of meeting that travel time on a

consistent basis (as expressed by on-time performance) is another key factor to consider. Infrastructure constraints in particular can affect on-time performance and an alternative's reliability. "On time" is defined as being no more than 5 minutes late, particularly for routes with published schedules such as a commuter rail or commuter bus service and for which this particular metric, the system on-time performance is evaluated. While on-time performance of one commuter rail or bus route is an important measure, the on-time performance of a combined system more accurately measures how well both a particular alternative will perform and how well it will do so without impacting the commuter system as a whole. As a point of reference, the MBTA System Wide Commuter Rail On-Time Performance for calendar year 2008 ranged from 78 to 95 percent. The on-time performance of each alternative is summarized in Table 3.3-8.

Table 3.3-8 On-Time Performance by Alternative

Name	On-Time Performance [1]
Stoughton Electric Alternative	97.9%
Stoughton Diesel Alternative	95.9%
Whittenton Electric Alternative	97.9%
Whittenton Diesel Alternative	95.9%

1 On-time performance for south side terminals as a result of the alternative's operating plan. On-time performance based on Systra's Network Simulation Analysis of Proposed 2030 MBTA/Amtrak Operations

As shown in Table 3.3-8, all Build Alternatives achieve an acceptable on-time performance.

3.3.2.4 Practicability Summary

The Corps has determined that the Stoughton and Whittenton Alternatives (electric and diesel) are both practicable alternatives.

3.3.3 Beneficial Effects and Environmental Impacts

This section compares each alternative's beneficial and adverse impacts to the aquatic, natural and human environment, and was undertaken in a manner compatible with the Corps' *Highway Methodology*[19] to evaluate alternatives and ensure that a transportation agency's preferred alternative is consistent with federal wetlands regulations, including 30 CFR 320-334 and 40 CFR 230 *et seq*.

The discussion below identifies beneficial or adverse impacts to the aquatic, natural and human environment to occur as a result of each alternative, particularly to wetlands, ACECs, threatened and endangered species, protected open space, public water supplies, land use, noise, air quality and environmental justice communities. These resources were selected from a full range of environmental impacts criteria because they are principal categories that either must be considered for permits and approvals and/or resulted in the greatest magnitude of change between all of the alternatives.

As stated in the Guidelines at Title 40 of the Code of Federal Regulations 230.10(a), "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." Therefore, the discussion below identifies impacts to the aquatic environment under the Clean Water Act, but also identifies other impacts to the

[19] United States Army Corps of Engineers. NEDEP-360-1-30, The Highway Methodology Workbook. October 1993.

overall natural environment (including the human environment), as is required under the Guidelines. The specific measures for each aspect are listed below.

The environmental impacts evaluation was based on two factors: "What are the beneficial effects and what are the adverse impacts?" These factors were further specified and evaluated based on their relevance to the project purpose, relationship to applicable statutes and regulations and the extent to which they would be likely to differ among alternatives:

- Beneficial Effects
    - To what extent would an alternative improve transportation conditions?
    - How well does an alternative serve environmental justice populations?
    - What are the air quality benefits that would be provided by each alternative?
    - What are the benefits that would be provided by each alternative to reduce greenhouse gas emissions that contribute to global climate change?
    - What smart growth opportunities would be provided by each alternative?
- Adverse Impacts
    - What would be the permanent wetland loss (in acres; edge and interior wetlands and floodplains)?
    - What would be the number of acres of protected open space[20] that would be directly impacted, acres of land acquisition and municipal tax loss?
    - What would be the number of acres of protected public water supply lands (active and inactive Mapped Wellhead Zone 1) that would be directly impacted?
    - What would be the noise impacts of each alternative?
    - What would be the number of acres of mapped Priority Habitat (state-listed rare species) that would be lost (edge and interior habitat)?

In addition to the aspects above, all other environmental aspects analyzed in Chapter 4 and 5 were also taken into consideration in evaluating the impacts and beneficial effects of the alternatives. Section 3.3.3.1 identifies the beneficial environmental effects of each alternative. Section 3.3.3.2 compares the alternatives based on key environmental impact criteria.

3.3.3.1 Beneficial Effects

This section focuses on the environmental benefits of each alternative by summarizing the benefits that would be provided to the transportation system, environmental justice populations, air quality, climate change, and smart growth. Environmental Justice and smart growth were evaluated qualitatively. Air quality and climate change were evaluated quantitatively.

Transportation

Public Transportation

The Build Alternatives would provide new public transportation service between the South Coast region and Boston with up to 4,570 daily boardings at new rail stations plus 1,100 boardings on existing bus

[20] Protected public open space lands are protected under Massachusetts' State Constitution, Article 97 (parks, conservation lands, recreation areas, wildlife refuges) and Section 4(f) of the Department of Transportation Act.

services or approximately 71.0 percent of the demand of 8,000 daily (i.e., weekday) work trips from the South Coast region to Boston.

The Stoughton Electric Alternative would result in the greatest beneficial effect, with the largest number of people benefitting from this new service (4,570 daily riders compared to 4,040 for Whittenton Electric) originating from the South Coast communities such as Fall River and New Bedford, which currently have the longest commute to Boston without public transportation. The Whittenton Alternative would benefit fewer people and a relatively smaller number of people would originate from the South Coast communities. Because the Whittenton Alternative would have relatively fewer riders from the municipalities that are the most distant from Boston, it would also result in a smaller decrease in daily VMT compared to the No-Build/Enhanced Bus Alternative than the Stoughton Alternative (201,232 vs. 255,932) and thus less benefits to the transportation system.

All Build Alternatives would provide a highly reliable public transportation service.

Regional Transportation Connectivity

The Stoughton and Whittenton Alternatives would have similar beneficial effects in terms of providing a one-seat ride from one municipality to another; so called interregional links.

Regional Freeway Conditions

The Build Alternatives would result in similar benefits to the regional freeway system. The four freeway segments analyzed on Route 24 between I-495 and I-93/Route 128 would see an improvement in Level of Service (LOS) under the Build Alternatives, including during the morning peak hour for all four segments (LOS E to LOS D or better; further information on these designations is provided in Chapter 4, [Section 4.1: Transportation]). The two segments of Route 24 south of I-93 and south of Pond Street would experience similar improvement in the southbound direction in the evening peak hour. Because of these changes, all Route 24 freeway segments from I-495 to I-93 under the Build Alternatives would operate at LOS D or better. There would also be improvements on I-93. I-93 south of Furnace Brook Parkway would also improve in the northbound direction in the morning peak hour (from LOS F to LOS E or better) and the two segments of I-93 south of Furnace Brook Parkway and south of Route 3 would improve (from LOS E to LOS D or better). Under the Build Alternatives, the two segments of Route 140 that were analyzed would continue to operate at LOS C or better.

Environmental Justice

This section compares the alternatives with regard to disproportionate adverse impacts and benefits to environmental justice populations, including property acquisition, change in noise or vibration levels or air quality, and the presence of traditional cultural properties and open space, improved access to transit services making it easier to reach employment and educational opportunities, general mobility, and improved air quality.

No-Build (Enhanced Bus) Alternative

Although there would be a minor improvement in the quality of transit service under the No-Build Alternative, the benefits resulting from improved transit access under the Build Alternatives would not occur.

Build Alternatives

Benefits associated with the Build Alternatives would be available to all populations regardless of designation. Increased access would reduce travel times to Boston and other employment centers. Average travel time savings from Fall River, Taunton, and New Bedford greatest under the Stoughton Electric Alternative, followed by the Whittenton Alternative which would improve travel times by 14 percent. The Stoughton Electric also represents the greatest travel time savings to colleges and hospitals. The Whittenton Diesel Alternative typically represents the least travel time savings of the rail alternatives.

The beneficial effects (Table 3.3-9) to environmental justice populations that would result from the South Coast Rail project vary considerably by alternative and community. Property values in environmental justice neighborhoods near stations may increase as a result of improved access to transit and subsequent TOD. If property values get too high, environmental justice populations may be priced out of their current locations. Conversely, property values in environmental justice neighborhoods along the alternative alignments may decrease as a result of increased noise from train operations.

Table 3.3-9 Summary of Beneficial Effects on Environmental Justice Populations

	Stoughton Electric	Stoughton Diesel	Whittenton Electric	Whittenton Diesel
Beneficial Effects (percent improvement compared to No-Build Alternative)				
Access to Jobs-[2]				
Taunton	118	77	67	44
Fall River	187	151	140	113
New Bedford	21	4	-1	-2
Access to Colleges[3]	78	46	52	33
Access to Hospitals[3]	188	135	132	102
Travel Time to Boston[4]	47	32	33	23
Station Area TOD[5]	Yes	Yes	Yes	Yes

1 Business and job displacements would result from private property acquisition for the Mansfield and Fall River Depot Stations, and would be minor as compared to the overall workforce in the surrounding community. See Chapter 4.2, *Land Use*, and Chapter 4.3, *Socioeconomics*.
2 Provided as an average in improvement, as compared to the No-Build Alternative, in access to basic, service, and retail jobs within a 90-minute radius of each municipality. Source: CTPS 2009.
3 Provided as an average in improvement, as compared to the No-Build Alternative, in access from Taunton, Fall River, and New Bedford to colleges and hospitals. Source: CTPS 2009.
4 Provided as an average in improvement, as compared to the No-Build Alternative, in travel times from Taunton, Fall River, and New Bedford to Boston's South Station. Source: CTPS 2009.
5 Qualitative assessment of the potential for transit-oriented development in the vicinity of the station site that would benefit environmental justice populations. Source: Goody Clancy

The Stoughton Electric Alternative would provide the greatest improvement in access to jobs for both Fall River and New Bedford environmental justice populations (187 and 21 percent, respectively).

Air Quality

This section compares the impacts of the alternatives on air quality. This includes a mesoscale analysis which estimates the area wide emissions in 2035 of VOCs, NO_X, CO_2, CO, and PM emissions based upon changes in the average daily traffic volumes, roadway lengths, and vehicle emission rates (including trains).

This section also compares the alternatives at the microscale level by assessing the potential for impact of motor vehicles and train locomotives on typically congested intersections ("hotspot locations") around stations, added the emissions of the diesel commuter rail trains to the intersection receptor locations to calculate the highest concentrations of CO, PM_{10}, and $PM_{2.5}$.

Greenhouse Gas (GHG) emissions were compared for the alternatives with regard to motor vehicle and train locomotive GHG emissions. The stations and layover facilities will all be open to the outside and will not need heating/air conditioning equipment. Because no buildings are associated with any of the alternatives, no discussion and consideration of recommendations of the Massachusetts Zero New Energy Building Task Force was included.

The air quality study qualitatively evaluated the potential for impact due to air toxics, as required in the Secretary of Environmental Affairs Certificate on the ENF. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Table 3.3-10 presents the mesoscale analysis results for all the alternatives.

No-Build Alternative

The No-Build Alternative would consist of enhancing current bus service along existing roads and highways. The limited increase in bus service along the roadways would have a minimal effect on the air quality within the study area.

Mesoscale Results—The No-Build Alternative VOC and NO_X emissions are typically lower than the Existing Conditions emissions due to the implementation of state and federal emission control programs, such as the Federal Motor Vehicle Emission Control Program, the Stage II Vapor Recovery System, and the Massachusetts Inspection and Maintenance program.

Microscale Results—The No-Build Alternative will meet the National Ambient Air Quality Standards (NAAQS) for CO, PM10, and PM2.5, and will not cause any new violation of the NAAQS; increase the frequency or severity of any existing violations; or delay attainment of any NAAQS.

Build Alternatives

Mesoscale Results—All rail alternatives would reduce emissions of $NO_{X,}$, CO, and CO_2, in comparison to the No-Build Alternative (See Table 3.3-10). All of the rail alternatives have a negligible effect on particulate matter emissions. The electric alternatives all have lower in emissions than the corresponding diesel alternative for all of the pollutants. The difference between the diesel and electric is most notable with the NO_X emissions where the emissions for the electric alternative are substantially less than the corresponding diesel alternative. This is due to the higher NO_X output related to the locomotives burning diesel fuel. The Stoughton Electric Alternative generally results in the greatest reduction in emissions which is consistent with the estimated highest reduction in VMT for the Stoughton Electric Alternative.

Table 3.3-10 Summary of the 2035 Mesoscale (Regional) Air Quality Analysis for the South Coast Rail Alternatives

		Vehicle Miles Traveled (VMT)[1]	Volatile Organic Compound (VOC) (kg/day)	Oxides of Nitrogen (NO_x) (kg/day)	Particulate Matter 10 (PM_{10}) (kg/day)	Particulate Matter 2.5 ($PM_{2.5}$) (kg/day)	Carbon Monoxide (CO- Winter) (kg/day)	Carbon Dioxide (CO_2) (tons/year)
No-Build	Total	118,897,192	22,200	19,256	3,240	1,490	1,050,356	24,717,339
Stoughton Electric	Total	118,641,260	22,160	19,159	3,240	1,490	1,048,074	24,656,479
	Difference from No-Build	-255,932	-40	-98	0	0	-2,281	-60,859
Stoughton Diesel	Total	118,656,844	22,160	19,210	3,241	1,491	1,048,400	24,688,173
	Difference from No-Build	-240,348	-40	-46	1	1	-1,956	-29,166
Whittenton Electric	Total	118,695,960	22,170	19,169	3,240	1,490	1,048,554	24,667,849
	Difference from No-Build	-201,232	-30	-88	0	0	-1,801	-49,490
Whittenton Diesel	Total	118,710,886	22,170	19,227	3,241	1,491	1,048,908	24,703,175
	Difference from No-Build	-186,306	-30	-29	1	1	-1,448	-14,164

1 VMT represents the vehicle miles traveled on an average weekday in 2035.
2 The Build Alternatives used for the air quality analysis include the physical and operational mitigation proposed to improve traffic operations (as outlined in Chapter 4.1, *Transportation*).
Note: Includes transit-related emissions changes (bus and rail)

Microscale Results—The trains that will be used on the rail alternatives could be electric or diesel. The electric trains do not emit air pollutants and will not have any contribution to air quality impacts on receptor locations around the stations. All of the pollutant concentrations are below (in compliance with) the NAAQS. The rail alternatives will not substantially change any of the concentrations of CO, PM_{10}, and $PM_{2.5}$. All of the increases are less than 1ppm for CO and less than 0.3 $\mu g/m^3$ for PM_{10} and $PM_{2.5}$ and all Build Alternatives will meet NAAQS for CO, PM10, and PM2.5, nor will they cause any new violation of the NAAQS; increase the frequency or severity of any existing violations; or delay attainment of any NAAQS.

Contribution to Climate Change/Greenhouse Gas Emissions

Climate change is an important consideration in evaluating the South Coast Rail project alternatives. The primary greenhouse gas emitted by transportation sources is CO_2. This analysis looked at CO_2 emitted by locomotives as well as reduction from reduced VMT (see Table 3.3-10).

No-Build Alternative

The No-Build Alternative would not reduce VMT and would thus not decrease GHG emissions.

Build Alternatives

The reduction in GHG emissions is directly related to the reduction in VMT. The Build Alternatives achieve the reduction in VMT by shifting commuters from cars to commuter rail. The Stoughton Electric Alternative would result in the greatest reduction in GHG emissions (60,859 tons/year of CO2), a greater reduction than the Whittenton Electric Alternative which would reduce GHG emissions by 49,490 tons/year. Overall the diesel alternatives would result in less reduction of GHG compared to the electric alternatives for both the Stoughton and Whittenton Alternatives.

Smart Growth

Each Build Alternative is anticipated to induce additional growth within the South Coast region as a result of improved transit access. However, the induced growth from each is relatively small (3.7 percent) in comparison to the No-Build Alternative, which is projected to increase the number of households by 75,212 by 2035. Local effects would vary considerably, especially in communities with stations. However, the cumulative impact even at the local level would be minimal. From a regional perspective the differences between the alternatives are minimal; cumulative effects are not a differentiator. As compared to the No-Build Alternative, the economic trends in combination with the impacts from both Build Alternatives would beneficially contribute to economic growth in the South Coast region. Under scenario 1 a wide range of local impacts would be broadly distributed, whereas under Scenario 2 these impacts are expected to be more concentrated in Priority Development Areas (PDAs).

As stated in the *South Coast Rail Economic Development and Land Use Corridor Plan,*[21] commuter rail service to the South Coast will generate nearly $500 million in new economic activity every year. This is new growth by the year 2030 that would not occur without the new infrastructure. The rail connection is projected to create between 3,500 and 3,800 net new jobs within the Commonwealth by 2030—about

[21] Massachusetts Executive Office of Transportation and Massachusetts Executive Office of Housing and Economic Development. *South Coast Rail Economic Development and Land Use Corridor Plan*. June 2009.

two-thirds of which would locate in the South Coast region with the remaining third in Boston-Cambridge and other communities outside the region.

The Corridor Plan would be implemented by MassDOT throughout the 31-community region regardless of which alternative was selected, so there would be no substantive difference among alternatives with regard to the majority of smart growth benefits. These benefits include protecting the Priority Preservation Areas (PPAs), and concentrating development in the PDAs. The principal differences among the alternatives would be with regard to their ability to promote concentrated development (transit-oriented development) at station areas. Transit-oriented development (or redevelopment), as illustrated by the concepts included in the Corridor Plan report, would include mixed high-density residential, retail, and commercial/office development at certain station locations. The benefits of this transit-oriented development would be to increase local tax revenues; decrease VMT, and decrease Greenhouse Gas emissions. As outlined in the Corridor Plan, transit-oriented development would be likely as new development or re-development at the Downtown Taunton, Taunton, Freetown, Fall River Depot, King's Highway, Whale's Tooth, Easton Village, and Raynham Place stations.

In summary, the increases in population and jobs from induced growth are expected to increase economic activity and property tax revenues within the South Coast region. The Build Alternatives would support the TOD and smart growth strategies outlined in the Corridor Plan.

3.3.3.2 Adverse Impacts

The following sections compare the alternatives based on five adverse environmental impacts:

- The amount of permanent wetland loss (in acres) (edge and interior wetlands and floodplains) and wetland loss in ACECs.
- The number of acres of protected open space that would be directly impacted, acres of land acquisition and municipal tax loss. Protected public open space lands are protected under Massachusetts' State Constitution, Article 97 (parks, conservation lands, recreation areas, wildlife refuges) and Section 4(f) of the Department of Transportation Act.
- The number of acres of protected public water supply lands (active and inactive Mapped Wellhead Zone 1) that would be directly impacted.
- The amount of noise impacts.
- The number of acres of mapped Priority Habitat (state-listed rare species) that would be lost (edge and interior habitat).

In addition to the above, other, related impacts are also disclosed, including:

- Secondary and/or Indirect Wetland Impacts
- Biodiversity Impacts, including wildlife habitat fragmentation.

Permanent Direct Wetland Loss

Impacts to waters of the United States, including adjacent wetlands, are the principal category of environmental impacts that must be considered by the Corps for Clean Water Act Section 404 permits

and by the Massachusetts Department Environmental Protection for variances under the Massachusetts Wetlands Protection Act (WPA). Direct wetland impacts, both temporary and permanent, are anticipated for each of the proposed alternatives.

Temporary impacts include short term disturbances (erosion controls, temporary structures, etc.) to wetlands and waterways during construction that would cease once construction activities are complete.

Permanent impacts are those that would result in the loss of waters of the United States, including wetlands. Permanent impacts may include, but are not limited to, wetland fill, dredging, and watercourse relocation or alteration. This analysis also evaluated the amount of wetland fill within an ACEC, as wetlands within ACECs receive a higher level of state regulatory protection.

No-Build (Enhanced Bus) Alternative

No wetland impacts would occur under the No-Build Alternative.

Stoughton Electric Alternative

The Stoughton Electric Alternative would impact 12.3 acres of waters of the United States—1.9 acres of open water and 10.4 acres of vegetated wetlands (primarily forested wetlands).

In terms of state wetland resources, Stoughton Electric Alternative would permanently impact 16,813 linear feet of Bank, 9.6 acres of Bordering Vegetated Wetland (BVW), 6.7 acres of Bordering Land Subject to Flooding (BLSF), and 7.9 acres of new development Riverfront Area. The largest impacts would occur in Raynham (1.3 acres of BVW) and Stoughton (2.0 acres of BVW), particularly south of the former Greyhound Park where the corridor forms the border of the Hockomock Swamp and then crosses through Pine Swamp. These impacts would occur in and along the edge of the abandoned railroad embankment. Minor impacts would occur along the components of the Southern Triangle, along the remainder of the Stoughton Line north of the Hockomock Swamp, at the Canton, East Taunton, Easton Village, and Raynham Park stations, and at traction power stations Stoughton TPSS-2 in New Bedford, Stoughton PS-1 in Easton, and Stoughton SWS-1 in Canton. Impacts would be closely evaluated during final design and would be minimized or avoided to the maximum extent practicable. Potential permanent wetland impacts along the Stoughton Line include 0.2 acre within the Hockomock Swamp ACEC. Indirect impacts within the Hockomock swamp would be minimal due to the existing rail bed and the proposed elevated trestle that would span 1.6 miles of the Hockomock Swamp. The elevated trestle would facilitate free wildlife passage across the proposed route, as well as maintain the current hydrology of the area. Additionally, approximately 1.5 acres of ORWs would be impacted along the Stoughton Electric Alternative.

Stoughton Diesel Alternative

Impacts to wetlands for the Stoughton Diesel Alternative are similar to the impacts identified above for the Stoughton Electric Alternative. The diesel alternative does not require traction power substations and would result in approximately 0.01 acre of permanent wetland impacts less than the Stoughton Electric Alternative along the New Bedford Main Line.

Whittenton Electric Alternative

The Whittenton Electric Alternative would impact 11.2 acres of waters of the United States—1.8 acres of open water and 9.4 acres of vegetated wetlands (primarily forested wetlands).

In terms of state wetland resources, the Whittenton Electric Alternative would permanently impact 16,581 linear feet of Bank, 8.4 acres of BVW, 5.0 acres of BLSF, and 7.8 acres of new development Riverfront Area. By town, the largest amount of impacts would occur in Berkley (1.4 acres of BVW) and Stoughton (2.0 acres).This alternative would leave the Stoughton Line corridor at Raynham Junction and instead would follow the Whittenton Branch to the Attleboro Secondary. This diversion would avoid wetland impacts in Pine Swamp. As with the Stoughton Alternative, the majority of impacts would occur in and along the edge of the abandoned railroad embankments. Minor impacts would occur along the components of the Southern Triangle, along the remainder of the Stoughton Line north of the Hockomock Swamp, at the Canton, East Taunton, Easton Village, and Raynham Park stations, and at traction power stations Whittenton TPSS-2 in New Bedford, Whittenton PS-1 in Easton, and Whittenton SWS-1 in Canton. Impacts would be avoided or minimized during final design to the maximum extent practicable.

Potential permanent wetland impacts along the Stoughton Line segment of this alternative include 0.2 acre within the Hockomock Swamp ACEC. Indirect impacts within the Hockomock swamp would be minimal due to the existing rail bed and the proposed elevated trestle that would span 1.6 miles of the Hockomock swamp. The elevated trestle would facilitate free wildlife passage across the proposed route, as well as maintain the current hydrology of the area. Additionally, approximately 1.1 acres of ORWs would be impacted along the Whittenton Electric Alternative.

Whittenton Diesel Alternative

Impacts to wetlands for the Whittenton Diesel Alternative are similar to the impacts identified above for the Whittenton Electric Alternative. The diesel alternative does not require traction power substations and would result in approximately 0.01 acre of permanent wetland impacts less than the Whittenton Electric Alternative along the New Bedford Main Line.

Secondary and/or Indirect Wetland Impacts

The secondary and/or indirect impact analysis evaluated the effects of the alternatives on wetland functions and values for all wetlands within 100 feet of the project limits (see Section 4.16.7.2). These impacts cannot be quantified, but are presented in a qualitative approach that identifies, for each wetland, the principal functions and values provided by that wetland, the magnitude of impact to those functions based on the physical extent of the impacts in comparison to the overall size of the wetland.

The results of the analysis are summarized in Table 3.3-11 and described below.

No-Build Alternative

The No-Build Alternative would not have any secondary and/or indirect impacts.

Table 3.3-11 Secondary and/or Indirect Effects on Wetlands within 100 feet of the Rail Segments along the Stoughton/Whittenton Alternative[1,4,5]

Function	Total Wetlands[2]	Negligible/ Minor		Moderate/ High		Total
		Active	Out-of-Service	Active	Out-of-Service	
Groundwater recharge/discharge	339/333	0	0/3	0	0/1	10/14[3]
Floodflow alteration	112/122	33	18/17	9	8	68/72
Fish and shellfish habitat	84/78	16	15/11	0	0	32/35
Sediment/toxicant/pathogen retention	145/151	45	11/8	20	5/2	88/88
Nutrient removal/retention/transformation	145/152	45	11/8	20	5/2	87/87
Production export	206/203	38	23/14	11	10/7	86/86
Sediment/shoreline stabilization	203/204	8	2/0	0	5	19/19
Wildlife habitat	144/145	39/40	52/50	13	12/10	118/127
Recreation	52/49	4	10/7	0	0	14/14
Educational/scientific value	10	0	5	0	0	5/5
Uniqueness/heritage	9/8	0	0	0	0	0/0
Visual quality/aesthetics	77/73	33	25/22	6	0	64/67
Endangered species habitat	96/102	27	15/12	4	22	68/69

1 Includes all wetlands within 100 feet of the right-of-way
2 Wetlands that perform each function as a principal function
3 Includes wetlands that would receive stormwater discharge that are more than 100 feet from the right-of-way
4 Where the alternatives are identical only one value is shown
5 The No-Build Alternative would have no indirect/secondary effects on wetlands

Build Alternatives

For both the Stoughton and the Whittenton Alternatives the majority of wetlands along either the active or inactive segments of the Stoughton Alternative would experience negligible to minor impacts to functions and values. In most cases, the wetlands are relatively large in comparison to the area in which functions would be lost or altered, and there would be little overall effect on the ability of the wetland to provide these functions. For both alternatives the wetland functions most affected would be wildlife habitat.

Although wetlands along both the active and inactive segments would experience a decrease in their ability to support wildlife habitat functions, including rare species habitat, these changes would be greater in the inactive segments due to the barrier effect of the reconstructed tracks. For both alternatives, the segment through the Hockomock Swamp would result in a minor effect on wildlife habitat through creation of a canopy gap although there would be no barrier to wildlife movement.

Stoughton Electric Alternative—The Stoughton Electric Alternative would affect the habitat function of 116 of the 144 wetlands, with 77 percent of the affected wetland experiencing negligible or minor impacts (see Table 3.3-11). The overhead catenary system would affect 58 wetlands as a result of the overhead catenary structures required to provide electric rail service, a majority of the wetlands which provide visual or aesthetic value.

Stoughton Diesel Alternative—The Stoughton Diesel Alternative would affect the habitat function of wetlands to the same degree as the Stoughton Electric Alternative with the exception of the effects to the 58 wetlands as a result of the catenary system.

Whittenton Electric Alternative—The Whittenton Electric Alternative would affect the habitat function of 113 of the 145 wetlands, with 80 percent of the affected wetland experiencing negligible or minor impacts (see Table 3.3-11). The overhead catenary system would affect 52 wetlands as a result of the overhead catenary structures required to provide electric rail service, a majority of which provide visual or aesthetic value.

Whittenton Branch—Along the Whittenton Branch, overall indirect or secondary impacts to wetlands are generally small, due to the proportionately small direct impacts along the route. A large portion of one wetland, Wetland TWB-08.1, would be eliminated to construct the railroad. This is a disturbed, mainly unvegetated wetland that has developed within the right of way due to compression of soils from ATV and other use of the path, and provides little function or value. The remaining impacts to wetlands along the Whittenton Branch are negligible or minor. The most affected wetland function is wildlife habitat, as barrier and noise effects along the currently inactive right of way could impact existing habitat or reduce the effective contiguous habitat size of wetlands. This effect is most likely to be seen in the approximately 0.3 mile section of the Whittenton Branch where the right of way branches off from the stone quarry access road. In this section, in the vicinity of Wetlands TWB 03.1 through TWB 01, both the western and eastern sides of the tracks have large areas of undeveloped land with only a narrow, mostly-vegetated path between them, whose size may be effectively reduced by constructing the railroad.

In summary, the effects of the Build Alternatives would be similar. The No-Build Alternative would not have any secondary and/or indirect impacts.

Open Space

This section discusses direct impacts to public open space (parks, conservation lands, recreation lands, and wildlife refuges), which are protected under Article 97 of the Massachusetts Constitution, and to publicly-owned wildlife sanctuaries and refuges which are considered "special aquatic sites" under the federal 404(b)(1) Clean Water Act Guidelines. Although the South Coast Rail project is currently not undergoing review by a federal transportation agency, this criterion also includes those properties protected under Section 4(f) of the federal Department of Transportation Act because the FTA and FHWA are cooperating agencies under NEPA.

No-Build (Enhanced Bus) Alternative

Minor increases in existing bus service along existing major roadways would have no impact on open space resources.

Build Alternatives

Table 3.3-12 provides a comparison of the ACEC land acquisition requirements for each South Coast Rail alternative. The Stoughton and Whittenton Electric Alternatives would each require acquisition of the same small portion (0.5 acre) of conservation land in the Hockomock Swamp ACEC. The parcel would be used for traction power substation for the Stoughton or Whittenton Electric Alternatives. None of the

ACEC land acquisitions would substantively impact any of the resources of concern for the respective ACECs. The diesel alternatives would not require any acquisition of ACEC lands.

Table 3.3-12 Summary of ACEC Land Acquisition Requirements for All Alternatives

	ACEC Lands	
Alternative	**Acquisition Area (acres)**	**Number of Parcels**
No-Build	0	0
Stoughton Electric	0.50	1
Stoughton Diesel	0	0
Whittenton Electric	0.50	1
Whittenton Diesel	0	0

Property Acquisition

In addition to open space analysis, a land use impacts analysis was conducted to determine if property acquisition would be required, and identify the ownership and use of parcels designated for acquisition. Final engineering plans may show an increase or decrease of the actual area of acquisition required.

No-Build (Enhanced Bus) Alternative

No new construction or land acquisition would be required for the No-Build Alternative. Therefore, the No-Build Alternative would have no direct impacts on land use.

Build Alternatives

The Build Alternatives would all require property acquisitions outside existing rights-of-way to accommodate the new stations and rail infrastructure. Summary tables of property impacts by municipality for the Stoughton Alternatives (Diesel and Electric) and Whittenton Electric Alternative are provided in Table 3.3-13.

The total acreage of property acquisition impacts of the Stoughton Electric Alternative (136.7 acres) and Whittenton Electric Alternative (136.8 acres) are nearly identical. The diesel versions of the rail alternatives result in 2.2 fewer acres of impact because of the need for traction power substations with the electric alternatives.

Table 3.3-13 Build Alternatives: Land Acquisition Summary by Municipality

Municipality	Public Ownership Area in acres (number of parcels)	Private Ownership Land Use Area in acres (number of parcels)				
		Commercial	Industrial	Residential	Undeveloped	Subtotal
Alignment						
Stoughton Alts.	4.1 (13)	0.9 (10)	11.8 (12)	15.7 (32)	15.2 (26)	43.6 (80)
Whittenton Alts.	2.2 (9)	9.0 (8)	14.6 (19)	13.7 (21) -	16.0 (28)	53.3 (76)
Substations						
Stoughton Alts.	1.1 (2)	-	<0.1 (1)	<0.1 (2)	1.1 (4)	1.1 (7)
Whittenton Alts.	1.1 (2)	-	<0.1 (1)	<0.1 (2)	1.1 (4)	1.1 (7)
Stations						
Stoughton Alts.	1.2 (2)	20.9 (15)	6.8 (11)	0.1 (1)	33.5 (12)	61.3 (39)
Whittenton Alts.	1.1 (2)	20.2 (14)	10.9 (20) -	0.1 (1)	22.5 (11)	53.7 (46)
Layover Facilities						
Stoughton Alts.	5.9 (1)	-	18.4 (2)	-	-	18.4 (2)
Whittenton Alts.	5.9 (1)	-	18.4 (2)	-	-	18.4 (2)
TOTAL						
Stoughton Alts.	12.3 (18)	21.8 (25)	37.0 (26)	15.8 (35)	49.8 (42)	124.4(128)
Whittenton Alts.	10.3 (14)	29.2 (22) -	43.9 (42)	13.8 (25)	39.6 (43)	126.5 (131)

Sources: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

Municipal Tax Loss

Property tax revenue data were obtained from review of on-line resources of the municipalities through which the alternatives pass. Estimates of annual (in 2009 dollars) property tax revenue loss from parcels were made based upon each municipality's property tax formula.

No-Build (Enhanced Bus) Alternative

No new construction or land acquisition would be required for the No-Build Alternative. There would be no impacts to property tax revenues.

Build Alternatives

Table 3.3-14 provides a comparative summary of the direct and indirect impacts to the social and economic environment potentially resulting from the Build Alternatives. There is no difference between the electric and diesel options for each Build Alternative.

The variations in property tax revenue losses do not correlate with the variations in private property acquisitions for each alternative. The Stoughton Alternatives would result in a greater amount of property tax revenue loss than the Whittenton Alternatives. Tax losses for both alternatives are dominated by the loss associated with the acquisition of the Fall River Depot Station site at $70,777—the single largest loss.

Table 3.3-14 Summary of Potential Effects to the Social and Economic Environment from All Alternatives

Alternative	Property Tax Revenue Loss[1]	Job Loss	Neighbor-hood Fragmentation	Residential Displacements (homes)	Business Displacements	Induced Jobs[3]	Induced Households[3]	Residential Property Value Change[2]
No-Build Alternative	0	No	None	0	0	0	0	No
Stoughton Alternatives	$197,251	Yes	Moderate	4	6	1,341	2,804	Yes
Whittenton Alternatives	$181,351	Yes	Moderate	3	6	1,341[4]	2,804[4]	Yes

1 Additional property tax revenue losses may result from small and/or partial acquisitions that cannot be determined at this phase.
2 Anticipated to increase in the vicinity of new stations and decrease in areas with moderate to severe noise impacts (railroad alignments and layover facilities).
3 Increase from No-Build Alternative; the total number of induced jobs and households is the same for Scenario 1 and 2.
4 Induced jobs and households for the Whittenton Alternatives were not estimated but are assumed to be similar to impacts of the Stoughton Alternatives.

All alternatives would result in job losses due to business displacements resulting from acquisition of private property with commercial lots for the station sites. It is not possible to project numbers of actual jobs lost at this phase of analysis, but only a few commercial buildings would be acquired and related job loss is assumed to be relatively minor. All Build Alternatives would result to a similar degree in residential displacements from acquisition of privately owned parcels with occupied residences. No-Build Alternative would result in community facility displacements.

Based on a review of residential and commercial property availability,[22] communities that would be impacted by residential displacements (Raynham) or business displacements (Fall River) have sufficient real estate capacity to absorb these displacements.

There are moderate differences in neighborhood fragmentation effects between the rail alternatives. Where active rail service is currently provided (Fall River Secondary, New Bedford Main Line, Attleboro Secondary, active portion of Stoughton Line, and Northeast Corridor), no neighborhoods would be fragmented by the construction, reconstruction, or operation of the commuter rail service. Where rail lines are out-of-service (inactive portion of Stoughton Line and Whittenton Branch) or have never previously existed, varying degrees of neighborhood fragmentation may result. Along the inactive portion of the Stoughton Line, some residential and commercial activity encroachment into the right-of-way has occurred, and over time some neighborhoods on either side of the alignment have developed continuity across the inactive railroad bed as residents have used the alignment for pedestrian transit. This appears to have been less common along the out-of-service Whittenton Branch, where residential neighborhoods tend to be located on one side of the alignment or the other. Accordingly, there would be less of a neighborhood fragmentation effect along the Whittenton Branch.

[22] Online research of residential real estate property availability conducted by reviewing current listings of similar homes (based on zoning of affected properties) in the affected communities at www.realtor.com. Commercial real estate vacancy rates conducted by telephone inquiries to chambers of commerce in the affected communities.

Protected Public Water Supply Land Impacts

This section discusses potential direct and indirect effects on water resource including protected public water supply lands. Surface and groundwater resources are protected under several state and federal regulatory programs, including the federal Clean Water Act (Section 404) and the Massachusetts Clean Waters Act (MGL Chapter 21, §26-53). Other applicable regulations include the Massachusetts Section 401 Discharge Regulations (314 CMR 9.00), Groundwater Quality Standards (314 CMR 6.00), Surface Water Quality Standards (314 CMR 4.00), and Wetland Protection Regulations (310 CMR 10.00). The limits of work proposed for each alternative were assumed to be the maximum extent of direct impacts.

No-Build Alternative

The No-Build Alternative does not include capital improvements that could increase impervious surface cover and impact water resources.

Build Alternatives

All of the Build Alternatives would have the potential to affect waterbodies and drinking water protection areas. All would require construction within public water supply Zone I areas, which is the area within 400 feet of a well that is generally afforded the greatest protection from development. All would upgrade existing transit corridors, which would have a negligible effect on pollutant loading. The Build Alternatives would build new rail lines on disused rail corridors, potentially introducing new pollutant sources in those areas. With mitigation and drainage features in place, none of the Build Alternatives are expected to impair any water resources. Potential impacts to the Hockomock Swamp and Fowl Meadow ACEC would occur due to stormwater discharges to Black Brook and the East Branch of the Neponset River, respectively from the Stoughton and Whittenton Alternatives. However, minimal impacts to ACECs from stormwater discharges would occur from the project. None of the above-mentioned discharges are associated with constructed stations, station platforms or parking areas. These discharges would primarily occur from conveyed overland flow from ditches along the railroad, which would carry negligible pollutant loads (with the exception of sediment). None of the proposed actions are expected to impair surface or groundwater resources within the ACEC. Compliance with the Massachusetts Stormwater Management Standards is provided for all stations except Stoughton and Dana Street. Compliance will be documented for these stations (as necessary) during later project design phase phases.

Stoughton Electric Alternative—The Stoughton Electric Alternative would involve construction within Zone II areas for six wells, and the IWPA for two wells. These areas would be disturbed only temporarily and would not receive any long-term impacts. This alternative would also require stormwater discharges to Zone II areas for six wells, the IWPA for two wells, and 10 different waterbodies, including one ORW within the Hockomock Swamp ACEC and the East Branch of the Neponset River in the Fowl Meadow ACEC. No Zone I areas would be affected by the construction on this line.

Along the Fall River Secondary no Zone A areas or groundwater protection areas (Zone I, Zone II, etc.) would be crossed by this line or receive any stormwater discharges. The stormwater discharges from the New Bedford Main Line would not be expected to contribute contaminants that would impair any waterbodies or water supplies. The existing stormwater discharges to the Zone A area for Fall Brook, Assawompset Pond, Long Pond, and Pocksha Pond would continue, but there would be no new impervious surfaces or pollutant sources tributary to this Zone A area. Due to the low potential for pollutant generation on the rail line, no impacts are expected to groundwater quality.

No electrical substations would be located in any IWPAs, Zone I areas, or Zone A areas. One electrical substation would be located in the Zone II for Easton GP Wells #1, #2, and #4 and would include secondary containment to minimize the risk of any surface or groundwater contamination from this location. With stormwater management measures in place, none of the stations or layover facilities is expected to impair any surface or groundwater resources. With mitigation and drainage features in place, the Stoughton Electric Alternative is not expected to impair any surface or groundwater resources.

Stoughton Diesel Alternative—The Stoughton Diesel Alternative would be comprised of the same elements as the Stoughton Electric Alternative as listed above and would have the potential to affect the same water resources. The Stoughton Diesel Alternative would have a slightly greater potential for pollutant loading due to the use of diesel fuel.

Whittenton Electric Alternative—The Whittenton Electric Alternative would involve construction within one Zone A area, the Zone I area for one well, Zone II areas for 10 wells, and the IWPA for two wells. These areas would be disturbed only temporarily and would not receive any long-term impacts. One new station, Easton Village Station, would be located in a Zone II area but would not have any impact on groundwater quality. This alternative would also require stormwater discharges to the Hockomock Swamp ACEC and the East Branch of the Neponset River in the Fowl Meadow ACEC.

While much of the rail corridor for this alternative already conveys diesel rail traffic under existing conditions, using the Whittenton Branch and reconstructing the Stoughton Line south of Stoughton Station would reintroduce rail traffic to a historic rail corridor. However, the Whittenton Electric Alternative is not expected to contribute contaminants that would impair surface or groundwater resources. The proposed drainage design includes measures to control new potential pollutant sources and would meet Massachusetts Stormwater Management Standards.

Along the Fall River Secondary no Zone A areas or groundwater protection areas (Zone I, Zone II, etc.) would be crossed by this line or receive any stormwater discharges. The stormwater discharges from the New Bedford Main Line would not be expected to contribute contaminants that would impair any waterbodies or water supplies. The existing stormwater discharges to the Zone A area for Fall Brook, Assawompset Pond, Long Pond, and Pocksha Pond would continue, but there would be no new impervious surfaces or pollutant sources tributary to this Zone A area. Due to the low potential for pollutant generation on the rail line, no impacts are expected to groundwater quality.

No electrical substations would be located in any IWPAs, Zone I areas, or Zone A areas. One electrical substation would be located in the Zone II for Easton GP Wells #1, #2, and #4 and would include secondary containment to minimize the risk of any surface or groundwater contamination from this location. With stormwater management measures in place, none of the stations or layover facilities is expected to impair any surface or groundwater resources.

With mitigation and drainage features in place, the Whittenton Electric Alternative is not expected to impair any surface or groundwater resources.

Whittenton Diesel Alternative—The Whittenton Diesel Alternative would be comprised of the same elements as the Whittenton Electric Alternative as listed above and would have the potential to affect the same water resources. The Whittenton Diesel Alternative would have a slightly greater potential for pollutant loading due to the use of diesel fuel.

Summary

The Whittenton Alternatives would be constructed and operated within a greater number of water protection zones. With regard to public water supply resources it is noted that the Whittenton Alternatives would require construction within public water supply Zone 1 areas (i.e. within 400 feet of the well), whereas the Stoughton Alternatives would avoid construction within public water supply Zone 1 areas. With mitigation and drainage features in place, none of the Build Alternatives are expected to impair any surface or groundwater resources.

Vibration Impacts

No-Build (Enhanced Bus) Alternative

Under the No-Build Alternative there would be no vibration impacts.

Build Alternatives

The Whittenton Alternatives result in 48 more impacted receptors than the Stoughton Alternatives, with the Attleboro Secondary segment of the Whittenton Alternatives being the primary cause of the greater impacts (Table 3.3-15). The noted vibration levels reflect annoyance and would not rise to a level considered to cause structural damage.

Table 3.3-15 Summary of Potential Vibration Impacts without Mitigation by Alternative

Alternative	Impacted Residences
No-Build (Enhanced Bus) Alternative	0
Stoughton Alternatives	369
Whittenton Alternatives	417

Noise Impacts

The noise analysis for the South Coast Rail project identified potential noise impacts by comparing the existing sound levels to projected future sound levels. The projected future noise levels would impact the human environment. There were two levels of impact (severe and moderate).

No-Build (Enhanced Bus) Alternative

Under the No-Build Alternative there would be no noise impacts.

Build Alternatives

Table 3.3-16 summarizes the total number of moderate and severe noise impacts by alternative for the operations of the rail line. All of the severe noise impact locations were evaluated for noise mitigation measures.

Stoughton Alternative—The Stoughton Electric Alternative (Stoughton, Southern Triangle-Fall River, and Southern Triangle-New Bedford segments) would result in 1,106 moderate and 341 severe impacts to residential receptors. The diesel operations would have similar impacts, with 1,085 moderate and 344 severe impacts.

Table 3.3-16 Summary of Projected Noise Impacts for South Coast Rail Alternatives

Alternative	Electric Alternative			Diesel Alternative		
	Moderate Impacts	Severe Impacts	Total	Moderate Impacts	Severe Impacts	Total
No-Build	0	0	0	0	0	0
Stoughton						
Stoughton	404	159	563	330	128	458
Southern Triangle - Fall River	466	135	601	570	181	751
Southern Triangle - New Bedford Main Line	236	47	283	185	35	220
Total	**1,106**	**341**	**1,447**	**1,085**	**344**	**1,429**
Whittenton						
Stoughton*	359	164	523	279	109	388
Whittenton	171	35	206	194	42	236
Southern Triangle - Fall River	466	135	601	570	181	751
Southern Triangle - New Bedford Main Line	236	47	283	185	35	220
Total	**1,232**	**381**	**1,613**	**1,228**	**367**	**1,595**

* Excludes the portion of the Stoughton line that is bypassed by the Whittenton Alternative (south of Raynham Junction).

Whittenton Alternative—The Whittenton Electric Alternative (Stoughton partial, Whittenton, Southern Triangle-Fall River, and Southern Triangle-New Bedford segments) would result in 1,232 moderate and 381 severe impacts to residential receptors. The diesel operations would have lower impacts, with 1,228 moderate and 367 severe impacts.

Summary

The Whittenton Alternative has the greatest track-related noise impacts (166 more impacts than the Whittenton Alternative), largely associated with the Whittenton Branch and the Attleboro Secondary Branch, which are located within densely populated areas. The Stoughton Alternative, by contrast traverses the Pine Swamp, a sparsely populated area located east of Taunton.

The diesel alternatives have somewhat lower noise impacts than the electric alternatives (18 fewer impacts) due to their slower operational speed compared to the electric alternatives.

Train Horn Noise

Severe noise impacts typically result from the close proximity to locomotive and rail car noise and from locomotive warning horns, which must be sounded one-quarter mile prior all public grade crossings. It should be noted that the majority of train horn impacts will occur at the same locations where rail operation impacts will occur. The train horn, however, is a uniquely different noise than the operations and was evaluated separately. A summary of these results can be found in Table 3.3-17. All of the severe noise impact locations were evaluated for noise mitigation measures.

Table 3.3-17 Summary of Projected Train Horn Noise Impacts for South Coast Rail Alternatives

Alternative	Moderate Impacts	Severe Impacts	Total
Stoughton			
Stoughton	437	457	894
Southern Triangle - Fall River	98	164	262
Southern Triangle - New Bedford Main Line	93	76	169
Total	**628**	**697**	**1,325**
Whittenton			
Stoughton*	368	374	742
Whittenton	460	708	1,168
Southern Triangle - Fall River	98	164	262
Southern Triangle - New Bedford Main Line	93	76	169
Total	**1,019**	**1,322**	**2,341**

* Excludes the portion of the Stoughton line that is bypassed by the Whittenton Alternative (south of Raynham Junction).

Train horns along the Stoughton Alternative would have 628 moderate and 697 severe impacts. The Whittenton Electric Alternative would result in the train horns producing 1,019 moderate and 1,322 severe impacts. The Whittenton Alternative results in the highest railroad grade crossing noise impacts.

In general, the Whittenton Alternatives have the greatest overall noise impact, both due to train movement and train horn usage at grade crossings.

Environmental Justice Impacts

This section compares the alternatives with regard to disproportionate adverse impacts to environmental justice populations, including property acquisition, change in noise or vibration levels or air quality, and the presence of traditional cultural properties and open space.

No-Build (Enhanced Bus) Alternative

Under the No-Build Alternative there would be no disproportionate impacts to Environmental Justice communities.

Build Alternatives

Impacts to environmental justice populations that would result from the South Coast Rail project are similar for all applicable resource topics with the exception of noise, as described below, and are summarized in Table 3.3-18.

Among the Build Alternatives, the Whittenton Alternatives would impact the greatest number of residences, and the Stoughton Alternatives the least. A greater percentage of noise and vibration impacts would be experienced by designated environmental justice populations under the Whittenton

Alternatives than the Stoughton Alternatives. This difference is attributable to the impacts of the Whittenton Alternative along the Attleboro Secondary through downtown Taunton.

Table 3.3-18 Summary of Adverse Effects on Environmental Justice Populations

Adverse Effects	No-Build	Stoughton Electric	Stoughton Diesel	Whittenton Electric	Whittenton Diesel
Neighborhood Disruption/Fragmentation	None	None	None	None	None
Residential Displacements	None	None	None	None	None
Business/Job Displacements[1]	None	Minimal	Minimal	Minimal	Minimal
Noise Impacts in Environmental Justice Neighborhoods (number of residences impacted by moderate and severe increases in noise levels)[2]	None	361	361	842	842
Percent of Total Noise Impacts in Environmental Justice Neighborhoods	None	25%	25%	30%	30%
Vibration Impacts in Environmental Justice Neighborhoods (impacted sensitive receptors)[3]	None	86	86	105	105
Percent of Total Vibration Impacts in Environmental Justice Neighborhoods	None	23%	23%	25%	25%

1 Business and job displacements would result from private property acquisition for the Fall River Depot Station, and would be minor as compared to the overall workforce in the surrounding community. See Chapter 4.2, *Land Use*, and Chapter 4.3, *Socioeconomics*.

2 Noise impacts data is based on the Stoughton and Whittenton Electric Alternatives; however the impacts of the diesel alternatives would be similar.

3 Diesel and electric vibration impacts would be the same.

Under all Build Alternatives and on a regional level, adverse noise impacts would not be disproportionately borne by state-listed environmental justice communities. However, on the municipal level, the analysis concludes that state-listed environmental justice populations in Fall River would experience disproportionately high and adverse noise impacts as compared to non-environmental justice populations under the Stoughton and Whittenton Alternatives prior to mitigation. Noise impacts to environmental justice and non-environmental justice areas would be mitigated.

Vibration impacts would be experienced across the region in both designated and non-designated environmental justice communities. Overall, adverse impacts would not be predominately borne by designated environmental justice communities under the Stoughton or Whittenton Alternatives. At the local level, designated environmental justice communities would experience a disproportionately high share of vibration impacts in Fall River under both the Stoughton and Whittenton Alternatives. Environmental justice communities in Taunton would experience a disproportionately high share of vibration impacts under the Whittenton Alternatives. Vibration impacts to environmental justice and non-environmental justice areas would be mitigated.

Loss of Priority Habitat

Rare species are considered an important environmental resource, protected under the Massachusetts Endangered Species Act and WPA. Temporary and permanent direct impacts to rare species and their habitat are anticipated for each of the alternatives. Direct impacts include impacts from construction, grading, vegetation management, and mortality associated with potential collisions with rail traffic. These activities may result in degradation of ecological function, loss of habitat, as well as loss of rare plant and animal species.

This section also describes the amount of 'barrier effect' for each alternative. A railroad corridor may act as a barrier that interferes with the movement of some mammals, amphibians, birds and reptiles from one habitat to another. The width of a railroad corridor can influence the frequency of wildlife crossings, as well as the mortality associated with potential collisions with rail traffic. The rail itself can create a barrier to smaller species such as amphibians, reptiles, and smaller mammals.

Table 3.3-19 summarizes the results of this analysis.

Table 3.3-19 Direct and Indirect Effects to Rare Species from the South Coast Rail Alternatives

Alternative	# of Priority Habitat (PH)	# of Rare Species Impacted	Migratory Route (Barrier effec t)
No-Build Alternative	0	0	0 miles
Stoughton Electric Alternative	5	8	3.2 miles
Stoughton Diesel Alternative	5	8	3.2 miles
Whittenton Electric Alternative	6	8	3.6 miles
Whittenton Diesel Alternative	6	8	3.6 miles
Stations	0	--	0 miles
Layover Facilities	0	--	0 miles

No-Build (Enhanced Bus) Alternative

None of the proposed park-and-ride facilities are within Estimated and Priority Habitats. Therefore, none of the components of the No-Build Alternative are expected to impact rare species and/or their habitat.

Build Alternatives

All Build Alternatives could impact eight state listed species, and would result in the loss of migratory route habitat because all rail alternatives require construction of new rail lines where currently there are none. An overview of potential direct and indirect effects is presented in Table 3.3-21.

Both Stoughton Alternatives would result in the loss of migratory route habitat (barrier effect) of approximately 3.2 miles.

Both Whittenton Alternatives would result in the loss of migratory route habitat (barrier effect) of approximately 3.6 miles.

In summary, the Whittenton Alternative would have greater impacts on Threatened and Endangered Species with a 11 percent greater barrier effect compared to the Stoughton Alternatives. The diesel alternatives would have slightly less potential impacts compared to the electric alternatives.

Impacts on Biodiversity

A comparison of the effects of the South Coast Rail alternatives on biological diversity (plant, wildlife and fish communities and habitats) is shown in Table 3.3-20.

Table 3.3-20 Summary of Environmental Consequences on Biodiversity

Alternative	Upland Habitat Loss (ac.)	Wetland Habitat Loss (ac.)	Fragmentation	Vernal Pool Habitat Loss (ac.)[1]	Loss of Surrounding Vernal Pool Upland Habitat[2] (ac.)
No-Build	0	0	No	0	0
Stoughton Electric	182.27	12.3	Yes	1.43	43.40
Stoughton Diesel	178.78	12.3	Yes	1.43	43.40
Whittenton Electric	187.98	11.2	Yes	0.8	41.61
Whittenton Diesel	183.87	11.2	Yes	0.8	41.61

1 Includes impacts (fill) to vernal pools and to any wetland area within 100 feet of the boundary of a vernal pool, where the pool is within a wetland.

2 Loss of supporting vernal pool upland habitat includes loss of buffer habitat defined as loss of forested wetland within 100 feet of VHP, and includes loss of upland habitat defined as upland habitat loss calculated for forested upland habitat between 100 and 750 feet of a vernal pool.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would not impact natural communities or biodiversity.

Build Alternatives

All Build Alternatives would result in the loss of upland habitat, wetland habitat, and vernal pool habitat (including direct and indirect impacts to vernal pools as well as supporting upland habitat used by vernal pool amphibians). All Build Alternatives, would result in habitat fragmentation and would create or exacerbate a barrier to wildlife movement (see Section 4.14.3).

Stoughton Electric Alternative—The Stoughton Electric Alternative includes improvements to existing active freight or rail lines from Canton Junction to Stoughton Station, and on the two Southern Triangle segments (the Fall River Secondary and New Bedford Main Line), as well as restoring out-of-service rail line from Stoughton Station to Longmeadow Street in Taunton. This alternative would include constructing a trestle through part of the Hockomock Swamp to reduce impacts to wetlands, biodiversity, and rare species.

Hockomock Swamp and Pine Swamp have been identified as areas of concern for biodiversity impacts. Potential impacts could include direct loss of habitat, fragmentation (either by creating a canopy gap or reducing the ability of wildlife species, including state-listed rare species, to cross the rail bed), introduction of invasive species, and increased noise.

The Stoughton Alternatives would exacerbate existing fragmentation of wetland and upland communities, particularly through the Hockomock Swamp and Pine Swamp, although the barrier effect would be reduced by constructing a trestle in the Hockomock Swamp.

The majority of this would result from reconstructing the Stoughton Line. This segment of the Stoughton Electric Alternative would increase habitat fragmentation (the existing rail bed, although out-of-service, has fragmented habitats and acts as a barrier to some organisms) within the Hockomock Swamp ACEC and the Pine Swamp. This barrier may affect several vernal pool complexes.

Stoughton Electric Diesel Alternative—The Stoughton Diesel Alternative would result in similar impacts to biodiversity as the Stoughton Electric Alternative. Because it would not require electrical power substations, the Stoughton Diesel Alternative would result in 3.49 acres less upland habitat loss, and 0.01 acre less wetland habitat loss when compared to the Stoughton Electric Alternative.

Whittenton Electric Alternative—The Whittenton Alternative includes improvements to existing active freight or rail lines from Canton Junction to Stoughton Station, along the Attleboro Secondary through downtown Taunton, and on the two Southern Triangle segments (the Fall River Secondary and New Bedford Main Line), as well as restoring out-of-service rail line from Stoughton Station to Raynham Junction on the Stoughton Line and along the out-of-service Whittenton Branch in Raynham and Taunton. This alternative would include constructing a trestle through part of the Hockomock Swamp to reduce impacts to wetlands, biodiversity, and rare species.

Areas subject to biodiversity impacts have been identified as the Hockomock Swamp, and the private land adjacent to the right-of-way near Prospect Pond in Taunton. Potential impacts could include direct loss of habitat, fragmentation (either by creating a canopy gap or reducing the ability of wildlife species, including state-listed rare species, to cross the rail bed), introduction of invasive species, and increased noise.

The Whittenton Alternatives would fragment wetland and upland communities, particularly through the Hockomock Swamp and along the Whittenton Branch, although the barrier effect would be reduced by constructing a trestle in the Hockomock Swamp. The majority of this would result from reconstructing the Stoughton Line north of Raynham Junction

It would also result from reconstructing the Whittenton Branch from Raynham Junction to Whittenton Junction. This segment of the Whittenton Electric Alternative would increase habitat fragmentation (the existing rail bed, although out-of-service, has fragmented habitats and acts as a barrier to some organisms). This barrier may affect vernal pools adjacent to the alignment.

The Hockomock Swamp ACEC is the only ACEC that would be impacted by the Whittenton Alternatives. Approximately 0.14 acre of vernal pool habitat, 2.31 acres of buffer habitat, and 6.12 acres of upland habitat would be impacted within the Hockomock Swamp ACEC.

Whittenton Diesel Alternative—The Whittenton Diesel Alternative would result in similar impacts to biodiversity as the Whittenton Electric Alternative. Because it would not require power substations, the Whittenton Diesel Alternative would require 4.11 acres less upland habitat loss, and 0.01 acre less wetland habitat loss, when compared to the Whittenton Electric Alternative.

In summary, the Whittenton Alternatives would have 1.1 acres less wetland loss than the Stoughton Alternatives and 0.63 acre less vernal pool wetland habitat loss than the Stoughton Alternatives. Overall, the diesel alternatives would have slightly less impact compared to the electric alternatives. The Stoughton Alternatives would result in approximately 5 acres less Upland Habitat loss than the Whittenton Alternatives.

Impacts on Biodiversity—CAPS Analysis

The University of Massachusetts' Conservation Assessment and Prioritization System (CAPS) model was used as a supplemental method of evaluating indirect impacts to biodiversity. CAPS is a software program designed to assess the ecological integrity and biodiversity value of every location based on

natural community-specific models. It is typically used to help prioritize lands for conservation action based on their assessed ecological value and provides a quantitative assessment of ecological integrity that can be used to compare various scenarios. The CAPS model was used to analyze the impacts of the South Coast Rail alternatives on ecological integrity taking into account both their physical barrier effects (measured as the presence or absence of rail tracks and ballast, the number of tracks, the presence and height of a trestle, and the presence and height of retaining walls) and their noise or disturbance effects (measured as the number of trains per day and the number of cars per train).

The CAPS analysis results showed similar impacts of the Stoughton and Whittenton Alternatives on ecological integrity, with the Whittenton Alternatives showing a slightly higher loss of Index of Ecological Integrity (IEI) Units compared to the Stoughton Alternatives. The trestle through the Hockomock Swamp would reduce the biodiversity effects for either the Stoughton or Whittenton Alternatives. A discussion of the CAPS analysis is presented in Chapter 4.14, *Biodiversity*.

The Stoughton and Whittenton Alternatives would equally reduce connectivity in the Hockomock Swamp with a gradient ranging from major impacts close to the rail line to negligible impacts at greater distances, compared to the existing connectedness. Without a trestle, these alternatives would result in substantial losses in connectivity in the Hockomock Swamp east of the rail line, between the former Raynham Greyhound Track and Foundry Street and between the rail line and Route 138, and in some areas west of the rail line. Moderate impacts would extend through much of the Hockomock, including areas east of Route 138. These impacts would be reduced by the trestle, with major losses restricted to a smaller area east of the rail line and north of the former Raynham Greyhound Track. Impacts would also extend over a smaller area compared to the “no-trestle” option.

The restoration of commuter rail through Pine Swamp in Raynham, for the Stoughton Alternatives, would result in a decrease in connectivity throughout the swamp when compared to the existing connectedness. The effect is moderate, with some higher areas of decrease occurring west of the rail line.

While a useful tool for considering landscape-level impacts and relative comparison of scenarios, there are several important limitations to the CAPS analysis. CAPS as applied to this project does not account for the effects of the existing railroad grade on overall landscape condition, as the analysis tool does not have this level of granular information. The CAPS analysis also does not take into account existing uses of the right-of-way, such as ATVs and their effect on ecological integrity (both in terms of physical disruption and noise disturbance). These frequent uses of the existing grade itself also serve to maintain at least a partial canopy gap, particularly north of the existing power line and also adjacent to portions of the existing Raynham Park racetrack. The CAPS program software does not account for these disruptive and fragmenting conditions and instead treats the Hockomock Swamp in its current condition as a single, unfragmented, continuous, uniformly intact habitat. Thus while it provides a measure of the potential benefits of the trestle, CAPS seemingly overestimates and overstates the existing ecological integrity of Hockomock and Pine swamps, and thus likewise overestimates the effects of South Coast Rail alternatives on ecological integrity.

Cultural Resources Impacts

This section identifies the potential direct and indirect, as well as the permanent and temporary construction impacts to historic and archaeological resources from implementation of the South Coast Rail alternatives. For each alternative and segment or element of alternative (e.g. station), direct, impacts on historic resources were analyzed.

No-Build Alternative

No impacts would result from construction and operation of the No-Build Alternative.

Build Alternatives

The overall impacts to historic and archaeological resources resulting from improving or constructing the Build Alternatives vary considerably between the alternative alignments (see Table 3.3-21).

Each of the alternatives would be similar in their adverse effects to historic structures. The majority of these effects, for all alternatives, would result from reconstructing historic bridges to accommodate an additional track, or to meet Federal Railroad Administration loading standards for commuter rail trains.

Each of the alternatives would also result in indirect impacts to historic properties as a result of a change in setting (visual impacts) or increased noise (which could affect a quiet setting or could result in noise mitigation that would alter the appearance or setting of a structure). These indirect effects (only visual, only noise, or a combination of the two) would impact the largest number of properties (72) for the Whittenton Electric Alternative.

Each of the alternatives would also have the potential to affect as yet to be determined archaeological resources and areas of archaeological sensitivity (which would require further investigation to determine if archaeological resources were present).

Adverse effects, including unanticipated discoveries will be further addressed through a Programmatic Agreement, a draft of which is included in Appendix 4.8-A.

Table 3.3-21 Summary of Potential Impacts to Historic and Archaeological Resources

Alternative	Historic Resources				Archaeological Sites
	Direct Impacts	Indirect Impacts			Recommended as Eligible
		Visual	Noise	Noise + Visual	
No-Build	0	0	0	0	0
Stoughton Electric	5	25	0	35	10
Stoughton Diesel	5	9	16	19	10
Whittenton Electric	5	32	0	33	11
Whittenton Diesel	5	11	14	19	11

Based on a comparison of the results of the Intensive Archaeological Survey on the Stoughton Line between Route 138 and Weir Junction, and the Whittenton Alternatives within the same section, the Whittenton Alternatives would have greater impacts to archaeological resources recommended as eligible for the National Register.

The Stoughton Alternatives would likely affect three sites: the King Philip Street Site and the Chickering Road site , and the East Brittania Street Site. Each of these sites yielded a low density of quartz chipping debris and other stone tools (a broken rhyolite point tip and an argillite cobble cortex, and a quart scraper). These three sites show evidence of stone tool manufacturing/maintenance.

The Whittenton Alternatives would affect three sites near the northern end of the Whittenton Branch: the Mel's Diner Site, Brown Couch Site, and ATV Site. Each of these yielded a low density of quartz chipping debris, and one granite hammerstone. These sites appear similar to the Pine Swamp sites.

More importantly, the Whittenton Alternatives would likely affect the Cedar Swamp Site, potentially related to a known Village Site. The Cedar Swamp Site yielded a more complex array of pre-contact materials, including quart chipping debris, an argillite flake, a chert flake, fire-cracked rock, and a "bowl-shaped cultural feature" potentially associated with a hearth.

Based on this information, the Whittenton Alternatives likely have greater adverse effects to cultural resources protected under Section 106 of the National Historic Preservation Act than do the Stoughton Alternatives.

3.3.3.3 Other Environmental Impacts

In addition to the benefits and impacts described above, other impacts were analyzed as well that are considered in the overall evaluation of environmental impacts of the alternatives.

Transportation

No-Build (Enhanced Bus) Alternative

Under the No-Build Alternative no impacts would occur to the regional highway system; however the benefits to the regional highway system provided by the Build Alternatives (discussed below) would not be realized. No impacts to grade crossings would occur and local intersections would not be impacted, other than impacts associated with background growth through 2035.

Build Alternatives

The traffic analysis evaluated the traffic impacts of each of the commuter rail stations proposed as part of the Build Alternatives. Additionally, regional highway operations were evaluated to determine projected benefits of the regional transit enhancement associated with each of the alternatives. Traffic conditions in the vicinity of each station and along the regional highway network were analyzed for existing conditions and future 2030 conditions with and without the project. Mitigation would be implemented for roadways and intersections that would be most impacted by traffic associated with commuter rail stations associated with rail alternatives. In cases where Build Alternatives-related traffic would result in a degradation of operating conditions when compared to the No-Build Alternative, mitigation measures were evaluated and would be implemented to address these impacts. An overview of each impact category is provided below.

Traffic Impacts associated with Grade Crossings

The Build Alternatives would have similar impacts on public grade crossings that would be in service along the Build Alternatives. A total of 52 existing active public grade crossings are present along the alignments of the Build Alternatives. Of these, four public crossings would be recommended for closure along the Fall River Secondary, which is common to all Build Alternatives.

The Stoughton Alternative would result in 43 active public grade crossings, and the Whittenton Alternative would result in 50 active public grade crossings. The Build Alternatives will require gates at grade crossings within Taunton, Raynham, Easton, Stoughton and Canton to be closed approximately six

times an hour, or approximately 10 percent of the peak hour. Two grade crossings are uniquely associated with the Whittenton Alternative and consist of the reactivation of two inactive grade crossings at Whittenton Street and Warren Street.

Traffic Impacts in Station Areas

The Build Alternatives would have similar impacts on intersections near stations along the Build Alternatives. The Whittenton Alternative would have impacts at the Dana Street Station while the Stoughton Alternative would have impacts at the Taunton Station. Impacts in both station areas would be effectively mitigated, as for all other impacted station areas.

No significant parking, bicycle and pedestrian impacts would be associated with the Build Alternatives, which would be similar in their extent of impact.

Impacts on Freight Operations

Feasible scenarios could be developed that would enable co-existence of freight operations and the Build Alternatives without impacting freight operations. While during the construction process of the Build Alternatives, freight operations would be temporarily impacted, the operation of the Build Alternatives would not interfere with freight operations. The permanent long-term infrastructure improvements to the rail network associated with the Build Alternatives would also benefit freight operations.

Visual and Aesthetic Resources

No-Build (Enhanced Bus) Alternative

The existing highway alignments that would be used by the No-Build (Enhanced Bus) Alternative present a visually disturbed environment from natural conditions. The alignments would not change and no new highway construction would be required for the No-Build Alternative. Using these highways for this alternative would not affect any visual or aesthetic resources.

Additional signage may be installed at the park-and-ride/bus facilities used by this alternative to direct motorists to parking areas. The impacts to the visual environment from streetscape changes as a result of potential park-and-ride lots/bus station expansions would be an incremental addition to the existing conditions.

Build Alternatives

The overall impacts to visual and aesthetic resources resulting from improving or constructing the Build Alternatives would not vary considerably between the alternative alignments. All Build Alternatives are rated with an overall moderate visual impact.

Both alternatives would require track and crossing upgrades, generally located in active, disturbed environments including rural and urban settings with one crossing of a designated “Wild and Scenic River” by the Fall River Secondary (see Chapter 4.10, *Open Space*). Stations and layover facilities would be located in developed or partially developed areas. The Weaver’s Cove East layover facility would be located near a Wild and Scenic River, resulting in moderate visual impacts. Tracks, stations and layover facilities would all have minimal to moderate visual impact, unless as noted otherwise below

Both the Stoughton and Whittenton Alternatives would substantially impact the visual environment at the historic Easton train station.

Both alternatives would substantially impact the visual environment in currently out-of-service segments for approximately 15 miles. For the Stoughton Alternative this includes the segment of the Stoughton Line through Pine Swamp, east of Taunton and for the Whittenton Alternative this includes the Whittenton Branch, located in the western portion of Taunton.

Common to both alternatives is the trestle through Hockomock Swamp, north of Taunton. Public views of the proposed 1.6-mile trestle would be limited throughout the Hockomock Swamp wildlife management area and will have a visual impact; however there is limited public access to this area.

Electric alternatives would have higher visual impacts than diesel alternatives due to the electrical infrastructure requirements (i.e. overhead catenary).

Farmland

This Section evaluates the specific impacts of each of the proposed alternatives to designated areas of mapped farmland soils.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative (Enhanced Bus) would consist of enhancing current bus service along existing roads and highways. None of three existing park-and-ride facilities that would be modified as part of the No-Build Alternative are within mapped areas of designated farmland soils. Under the No-Build Alternative, minor modifications are proposed to these existing parking lots that would not disturb additional land. No impacts to farmland soils are anticipated under the No-Build Alternative.

Build Alternatives

Potential impacts to mapped areas of designated farmland soils for each of the Build Alternatives is presented in Table 3.3-22. Using the USDA scoring system, the impacts to farmland soils along all Build Alternatives all received similarly low scores. Such scores indicate that these impacts would not be considered significant under the FPPA, and that mitigation for these losses would not be required for any of the Build Alternatives.

Table 3.3-22 Impacts to Designated Farmland Soils by Alternative (acres)[1]

Alternative	Southern Triangle	Northern Element	Stations	Total
No-Build/Enhanced Bus Alternative	--	--	--	0
Stoughton Electric Alternative	--	2.6	16.0	18.6
Stoughton Diesel Alternative	--	--	16.0	16.0
Whittenton Electric Alternative	--	2.6	16.2	18.8
Whittenton Diesel Alternative	--	--	16.2	16.2

Does not include potential mid-day layover facility impacts.

Stoughton Electric Alternative—The Stoughton Electric Alternative would result in impacts to 12.9 acres of designated farmland soils. Much of this impact occurs as a result of development of the North Easton and Taunton Depot station sites (7.3 and 5.7 acres, respectively).The remaining impacts occur as a result of the traction power stations associated with the electrification of the Stoughton Line and the development of the Freetown station site. One of the traction power stations (TPSS-1) is located within the Hockomock Swamp ACEC and would impact 1.1 acres of designated farmland soils.

Stoughton Diesel Alternative—The Stoughton Diesel Alternative would result in impacts to 10.3 acres of designated farmland soils. This impact is slightly less than the electrification alternative because there are no traction power stations required along the Stoughton Line under the diesel alternative. The remaining impacts occur due to development of the North Easton and Freetown station sites.

Whittenton Electric Alternative—The Whittenton Electric Alternative would result in impacts to 18.6 acres of designated farmland soils, the largest impact to farmland soils of all of the alternatives. Much of this impact occurs as a result of development of the North Easton and Taunton Depot station sites (7.3 and 5.7 acres, respectively). The remaining impacts occur as a result of the traction power stations associated with the electrification of the Stoughton Line and the development of the Freetown station site and the Dana Street Station site. One of the traction power stations (TPSS-1) is located within the Hockomock Swamp ACEC and would impact 1.1 acres of designated farmland soils.

Whittenton Diesel Alternative—The Whittenton Diesel Alternative would result in impacts to 16.0 acres of designated farmland soils. This impact is 2.6 acres less than for the Whittenton Electric Alternative, because no traction power stations would be required for the diesel alternative.

Summary

The Stoughton Alternative would have substantially less impact on designated farmland soils compared to the Whittenton Alternative (which has additional impacts associated with the Taunton Depot and Dana Street station sites). The diesel alternatives have slightly less impacts overall than the electric alternatives due to the absence of traction power stations.

Hazardous Materials

No-Build Alternative

The No-Build Alternative would not require acquisition of properties with Recognized Environmental Conditions (RECs) and therefore would not require remediation or soil/groundwater management during construction.

Build Alternatives

Each of the Build Alternatives would require acquisition of properties with Recognized Environmental Conditions (RECs) that would require further investigation. In each case, remediation or soil/groundwater management during construction could be required. Table 3.3-23 summarizes the number of RECs and the impact that were identified for each alternative.

Table 3.3-23 Summary of RECs by Alternative

Alternative	Total Number of Stations/Bypasses	Total Number of RECs	Number of Low Impact RECs	Number of Medium Impact RECs	Number of High Impact RECs
Stoughton Alternatives	11/0	29	5	18	6
Whittenton Alternatives	11/0	32	6	21	5

The Stoughton, and Whittenton Alternatives each have at least seven high impact RECs that were identified, and these alternatives also have the potential to encounter soil or groundwater contamination. Taunton Station on the Stoughton Alternatives, and Dean Street on the Whittenton Alternatives have three and one high impact RECs, respectively, that were identified.

The Stoughton Alternatives and the Whittenton Alternatives would have environmental benefits associated with remediating contaminated sites, particularly the station sites with known soil and groundwater contamination such as the Taunton station site. Each of the two layover sites associated with the Build Alternatives would involve acquisition of five properties with RECs that would require further investigation and potentially requiring remediation or soil/groundwater management during construction could be required.

The Stoughton and Whittenton Alternatives are similar with regard to their impact related to hazardous materials and would benefit environmental conditions through remediation of Recognized Environmental Conditions.

Geology

No-Build Alternative

The No-Build Alternative (Enhanced Bus) would consist of enhancing current bus service along existing roads and highways. Construction activities would be limited to the modification of three existing Park and Ride facilities, requiring limited clearing and excavation. No long-term changes would be expected to geologic structures or faults, to bedrock, soils, or geologic stability, to seismicity, or to the rock and soil units surrounding excavations.

Maintenance and development activities within the South Coast Rail project area would be expected to continue, and would create changes in the built environment, but would not adversely impact soils and geologic conditions. Normal geologic processes, such as erosion and sedimentation, would also continue. No specific impacts with respect to soils or geology would be anticipated under the No-Build Alternative.

Build Alternatives

None of the Build Alternatives would require tunneling or other deep excavation that would significantly affect geological conditions. Most disturbance activities would encompass a relatively small area within or adjacent to previously disturbed areas and infrastructure. These include active rail and abandoned rail beds (Stoughton line and Whittenton Branch) that have previously been established to be compatible with subsurface conditions. No long-term changes would be expected as a result of the Build Alternatives to geologic structures or faults, to bedrock, soils, or geologic stability, to seismicity, or to

the rock and soil units surrounding excavations. No long-term adverse impacts to soils and geology would occur with the Build Alternatives; therefore, no mitigation will be required.

Indirect Effects

Potential indirect effects (beneficial and adverse) of the rail alternatives were evaluated with and without smart growth measures (including TOD). The Corridor Plan was the guiding land use development plan for this analysis. Induced growth that would result from the rail alternatives includes the creation of new residential development and jobs. In order to assess the indirect effects of this induced growth, two scenarios were developed to allocate growth in the South Coast region. The first scenario, Scenario 1, allocates induced growth under business as usual conditions, includes baseline conditions, and assumes that induced growth would occur in a traditional pattern. The second scenario, Scenario 2, assumes that growth would be directed to Priority Development Areas (PDAs) and away from PPAs, based on the planning efforts of each municipality in the South Coast region.

Because the same level of induced growth distributed among the municipalities is expected for either the Stoughton or the Whittenton Alternatives, there would be no discernible difference in indirect effects under each alternative for purposes of comparison among the Build Alternatives. The indirect effects of the No-Build Alternative are reflected in the baseline growth through 2035. A resource-specific analysis of indirect effects is provided in Chapter 5.

Cumulative Impacts

Table 3.3-24 summarizes the incremental changes to the evaluated resources from the South Coast Rail alternatives that, in combination with past activities or trends and other known current and future projects, would potentially result in a substantive cumulative effect. The comparison is provided for both scenarios for the two alternatives considered in this evaluation, in relationship to the status of these resources under the projected No-Build Alternative conditions in 2035. Because there is no substantive difference between the impacts from rail alternatives' electric- or diesel-powered trains, these options are not included in this summary comparison.

Table 3.3-24 shows that in comparison to the No-Build Alternative, the Stoughton and Whittenton Alternatives would not have an adverse cumulative impact on the evaluated resources. There would be only minor differences in the cumulative effects of the Stoughton and Whittenton Alternatives, attributable to the minor differences in direct effects. For many resources, the cumulative impacts of Scenario 1 represent an insubstantial change from the conditions that would exist under the No-Build Alternative. In general, the cumulative effects of either alternative would be beneficial, depending upon the extent of implementation of Smart Growth measures.

Table 3.3-24 Summary of Cumulative Impacts

	Resource					
	Land Use	**Wetlands**	**Biodiversity**	**Protected Open Space**	**Air Quality**	**Economy**
No-Build Alternative	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 928,031
	308,371 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	116,675 acres of decreased habitat quality in 2035	64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 75,212
		124,748 acres of wetlands remaining in 2035	307,813 acres of natural land remaining in 2035		28,691,855 tpy CO_2 emissions in 2035	Jobs: 417,864 Business Activity: $99B Tax Revenue: N/A
Stoughton Alternative Scenario 1	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	307,030 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	120,605 acres of decreased habitat quality in 2035	64,794 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,756 acres of wetlands remaining in 2035	303,883 acres of natural land remaining in 2035		27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B| Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)

	Resource					
	Land Use	Wetlands	Biodiversity	Protected Open Space	Air Quality	Economy
Whittenton Alternative Scenario 1	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	307,045 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	120,595 acres of decreased habitat quality in 2035	64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,754 acres of wetlands remaining in 2035	303,893 acres of natural land remaining in 2035		27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)
Stoughton Alternative Scenario 2	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	315,583 to 319,259 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	58,760 to 75,021 acres of decreased habitat quality in 2035	>64,794 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,759 to 124,760 acres of wetlands remaining in 2035	349,331 to 365,592 acres of natural land remaining in 2035		<27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)

	Resource					
	Land Use	Wetlands	Biodiversity	Protected Open Space	Air Quality	Economy
Whittenton Alternative Scenario 2	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	315,598 to 319,274 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	58,750 to 75,011 acres of decreased habitat quality in 2035	>64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,757 to 124,758 acres of wetlands remaining in 2035	349,477 to 365,738 acres of natural land remaining in 2035		<27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)

Table 3.3-25 Summary of Direct Impacts

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Description	Minor bus schedule enhancements	Electric or diesel commuter rail service to South Station using the Northeast Corridor, Stoughton Line, New Bedford Main Line, and Fall River Secondary. Ten new commuter rail stations would be constructed (North Easton, Easton Village, Raynham Park, Taunton, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove) and major reconstruction would occur at two existing commuter rail stations (Canton Center and Stoughton).		Variation of the Stoughton Alternative route using the abandoned Whittenton Branch right-of-way through the City of Taunton to avoid the Pine Swamp in Raynham. Ten new commuter rail stations would be constructed (North Easton, Easton Village, Raynham Park, Dana Street, Taunton Depot, King's Highway, Whale's Tooth, Freetown, Fall River Depot, and Battleship Cove and major reconstruction would occur at two existing commuter rail stations (Canton Center and Stoughton).	
Capital Cost (billions)	N/A	$1.82	$1.27	$1.82	$1.27
Operating and Maintenance Cost (millions)	N/A	$33.9	$33.8	$36.2	$36.1
Cost per rider[1]	N/A	$35.28	$29.71	$39.60	$33.32
Years to Construct	N/A	4.5	4	4.5	4
Transportation (Section 4.1)					
Reduction in Daily Regional Vehicle Miles Traveled (2035)	N/A	-255,932	-240,348	-201,232	-186,306
Travel Time- New Bedford to South Station (peak period), 2035	100	77	82	84	89
Daily Ridership (2035) at new stations[2]	N/A	4,570	4,430	4,040	3,930
Increase in Total Commuter Rail System Daily Ridership (2035)	N/A	10,300	9,750	9,400	8,950

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Land Use and Zoning (Section 4.2)					
Total Acreage to be Acquired (private and public)	0	136.73	134.33	136.83	134.63
Socioeconomics (Section 4.3)					
Residential Displacements	0	4	4	3	3
Business Displacements	0	6	6	6	6
Property Tax Revenue[3] Loss	0	$197,251	$197,251	$181,351	$181,351
Environmental Justice (Section 4.4)					
Noise Impacts in Environmental Justice Neighborhoods (number of residences impacted by moderate and severe increases in noise levels)	N/A	361		842	
Percent of Total Noise Impacts in Environmental Justice Neighborhoods	N/A	25%		30%	
Vibration Impacts in Environmental Justice Neighborhoods (impacted sensitive receptors)	N/A	86		105	

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Percent of Total Vibration Impacts in Environmental Justice Neighborhoods	N/A	23%		25%	
Visual Resources (Section 4.5)					
	Minimal impact.	Moderate overall impact on visual resources. Substantial impacts would occur in the out-of-service portion of the Stoughton line segment, from the Stoughton Station south to Weir Junction.	Moderate impact on visual resources overall, but less than Stoughton Electric because overhead electrical infrastructure would not be needed.	Moderate overall impact on visual resources. Substantial impacts would occur in the out-of-service portion of the Stoughton line and Whittenton Branch segments, from the Stoughton Station south to Raynham Junction and on to Whittenton Junction.	Moderate impact on visual resources overall, but less than Whittenton Electric because overhead electrical infrastructure would not be needed.
Noise (Section 4.6)					
Moderate Impacts Before Mitigation (# of Sensitive Receptors)	N/A	1,106	1,085	1,232	1,228
Severe Impacts Before Mitigation (# of Sensitive Receptors)	N/A	341	344	381	367
Vibration (Section 4.7)					
Impacted Residences (Without Mitigation)	0	369	369	417	417
Cultural Resources (Section 4.8)					
Direct Impacts to Historic Resources	0	5	5	5	5

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Indirect Impacts to Historic Resources (Visual Impacts)	0	25	9	32	11
Indirect Impacts to Historic Resources (Noise Impacts)	0	0	16	0	14
Indirect Impacts to Historic Resources (Visual and Noise Impacts)	0	35	19	33	19
Known Archaeological Sites	0	10	10	11	11
Air Quality (Section 4.9)					
Exceedance of National Ambient Air Quality Standards?	No	No	No	No	No
Regional Volatile Organic Compound Emissions (kg/day)	22,200	22,160	22,160	22,170	22,170
Regional Oxides of Nitrogen Emissions (kg/day)	19,256	19,159	19,210	19,169	19,227
Regional Particulate Matter 10 Emissions (kg/day)	3,240	3,240	3,241	3,240	3,241
Regional Particulate Matter 2.5 Emissions (kg/day)	1,490	1,490	1,491	1,490	1,491

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Regional Carbon Monoxide Emissions (kg/day)	1,050,356	1,048,074	1,048,400	1,048,554	1,048,908
Regional Carbon Dioxide Emissions (Tons/Year)	24,717,339	24,656,479	24,688,173	24,667,849	24,703,175
Open Space (Section 4.10)					
Land Acquisition from Protected Open Space (acres)	0	0.16	0.16	0.16	0.16
Farmland (Section 4.11)					
Impacts to Designated Farmland Soils (Acres)	0	18.6	16.0	18.8	16.2
Hazardous Materials (Section 4.12)					
Recognized Environmental Conditions (including layover facilities)[23]	0	39	39	42	42
Geology (Section 4.13)					
	No long-term adverse impacts	No long-term adverse impacts		No long-term adverse impacts	

[23] Sites with the presence or likely presence of hazardous materials.

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Biodiversity (Section 4.14)					
Upland Habitat Loss (acres)	0	182.27	178.78	187.98	183.87
Wetland Habitat Loss (acres)	0	12.3	12.3	11.2	11.2
Vernal Pool Habitat Loss (acres)	0	1.43	1.43	0.8	0.8
Loss of Supporting Vernal Pool Upland Habitat (acres)	0	43.40	43.40	41.61	41.61
Habitat Fragmentation	None	Increase in existing habitat fragmentation would result from reconstructing the Stoughton Line on the currently unused railbed, including in the Hockomock Swamp ACEC and the Pine Swamp.		Increase in existing habitat fragmentation would result from reconstructing the Stoughton Line and Whittenton Branch on currently unused railbeds, including in the Hockomock Swamp ACEC.	
Threatened and Endangered Species (Section 4.15)					
Impacted Species Habitat	None	Impacts to the habitat of eight state-listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, coastal swamp amphipod, mocha emerald dragonfly, Hessel's hairstreak, pale green pinion moth, and water-willow stem borer). Barrier effect on blue-spotted salamander, Blanding's turtle, and eastern box turtle considered moderate impacts.		Impacts to the habitat of eight state-listed species (blue spotted salamander, Blanding's turtle, eastern box turtle, coastal swamp amphipod, mocha emerald, Hessel's hairstreak, pale green pinion moth, and water-willow stem borer moth). Barrier effect on Blue-spotted salamander, Blanding's turtle, and eastern box turtle considered moderate impacts.	
Loss of migratory route habitat (barrier effect) (linear feet)	0	3.2 miles	3.2 miles	3.6 miles	3.6 miles

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Wetland Resources (Section 4.16)					
Waterway Direct Permanent (acres)	0	1.9	1.9	1.8	1.8
Vegetated Wetland Direct Permanent Impacts (acres)	0	10.4	10.4	9.4	9.4
Total Federal Wetland Impacts (acres)	0	12.3	12.3	11.2	11.2
Wetlands Impacts within ACECs (acres)	0	0.2	0.2	0.2	0.2
Bank (lf)	0	16,813	16,813	16,581	16,581
Outstanding Resource Waters (acres)	0	1.5	1.5	1.1	1.1
Bordering Land Subject to Flooding (acres)	0	6.7	6.7	5.0	5.0
Riverfront Area (acres)	0	7.9	7.9	7.8	7.8
Water Resources (Section 4.17)					
	None	Surface and groundwater resources would not be impaired due to the use of stormwater treatment practices.		Surface and groundwater resources would not be impaired due to the use of stormwater treatment practices.	

	No-Build (Enhanced Bus) Alternative	Stoughton Electric Alternative	Stoughton Diesel Alternative	Whittenton Electric Alternative	Whittenton Diesel Alternative
Coastal Zone (Section 4.18)					
Consistent with Massachusetts Coastal Zone Management Program (MCZMP) Policies?	N/A	Yes	Yes	Yes	Yes
Number of Chapter 91 Regulated Resources Crossed[5]	0	36	36	31	31

1 Annualized capital cost and annual operating and maintenance cost estimates divided by annual passengers.
2 New daily round-trip transit trips at proposed South Coast Rail stations
3 Additional property tax revenue losses may result from small and/or partial acquisitions.
4 Sites with the presence or likely presence of hazardous materials
5 Massachusetts General Law Chapter 91 is implemented by Massachusetts Regulations at 310 CMR 9.00 (Waterways Regulations). The purpose of Chapter 91 and the Waterways Regulation is to protect certain public rights that are inherent in tidal waters of the Commonwealth and certain non-tidal rivers and streams. New construction, changes in use or substantial expansions of existing structures within these jurisdictional areas require approval under these regulations.

3.3.4 APPLICANT'S PREFERRED ALTERNATIVE

The EPA regulations at 40 CFR part 230 (the Section 404(b)(1) Guidelines) state (230.10(a)):

> "...no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge, which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences."

This summary provides an overview of the alternatives. The first step in the alternatives analysis is to determine whether the alternative meets the project purpose. Based on the analysis it was determined that all four Build Alternatives meet the project purpose.

The second step in the evaluation determines whether an alternative is practicable. Based on the analysis it was determined that all four Build Alternatives are practicable.

The third step in the alternatives analysis includes two sub-criteria: beneficial environmental effects and environmental impacts. The full extent of this information is presented in Tables 3.3-24 and 3.3-25, in the preceding sections, and in Chapters 4 and 5 of this FEIS/FEIR. The results are summarized below.

3.3.4.1 Findings

Having determined that the Attleboro and Rapid Bus alternatives – including the various permutations of each – are not practicable alternatives, we are left to consider whether the Whittenton route, and diesel or electric mode of each, would have less adverse impact on the aquatic ecosystem than the alternative that is proposed (i.e., the applicant's preferred alternative), without having other significant adverse environmental consequences. We can conclusively state that the Stoughton Alternative meets the overall project purpose and that it is practicable. The Whittenton Alternative also meets the overall project purpose albeit to a lesser degree: It is predicted to have slightly lower overall ridership than the Stoughton Route, and in particular, it draws fewer riders from the target termini of New Bedford and Fall River. Some (notably, citizens and leaders of those cities) would argue that it therefore does not meet the intent of the overall project purpose: "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts, and to enhance regional mobility." On this point however, others have reasonably questioned whether a roughly 8-minute longer (one-way) daily commute would indeed cause the non-trivial reductions in ridership predicted by the models. The Corps has concluded that the Whittenton Alternative ridership numbers are not so low that this alternative could be considered as failing to meet the overall project purpose.

From this, we are left to determine whether the Whittenton Alternative is practicable. As previously mentioned, practicable means "available and capable of being done considering costs and logistics in light of overall project purposes" (40 CFR 230.10(a)(2). The Whittenton route is wholly owned by MassDOT and was in fact the route last used for passenger service between Boston and New Bedford up until 1958 when operations ceased. Therefore, it is unquestionably available. Moreover, the costs of the Whittenton Alternative are only marginally higher than would be the Stoughton Alternative, and are not the deciding factor with respect to practicability. The practicability of the Whittenton Route, then, rests on its logistical feasibility. Some commenters (notably, citizens and leaders of Taunton) have argued that it is not, based on the substantially higher number of at-grade crossings and the overall impacts to the already congested downtown Taunton area. Public safety is another issue with regard to logistics, and it is not a trivial matter that doubling the number of at-grade crossings in Taunton at least doubles the likelihood of a serious incident such as a life-threatening collision between a train and a vehicle or

person in that community. The Federal Railroad Administration has indicated that such situations are not ideal; however they also are not insurmountable from the perspective of general rail operations, and there are examples of municipalities with similar or greater logistical constraints than would be encountered in the City of Taunton under a Whittenton Alternative. Therefore, we conclude that the Whittenton Alternative is indeed a practicable alternative.

The determination, therefore, rests on a comparison of the overall environmental impacts of the Stoughton and Whittenton Routes (and diesel or electric modes). On initial inspection, it is readily seen that the Stoughton Alternative has greater impacts to aquatic resources – approximately 1.0 acre more wetland would be filled under the Stoughton Route than under the Whittenton Route. While both routes would affect Hockomock Swamp equally, the Whittenton route would bypass Pine Swamp and other wetlands north and south of Pine Swamp, and thus would result in fewer acres of wetland loss than would the Stoughton Route. As noted in the USEPA Guidelines, "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, *so long as the alternative does not have other significant adverse environmental consequences"* (emphasis added). The Guidelines do not limit other significant adverse environmental consequences to the aquatic environment.

Thus the determination rests on whether the impacts to other environmental resources of the Whittenton route outweigh the slightly higher aquatic resource impacts of the Stoughton Route. Such environmental resource impacts are relevant to the natural environment in general and the human environment in particular. These include effects to cultural resources, public safety and environmental justice communities, and other environmental resource impacts including (but not limited to) air quality, water quality, endangered species, biodiversity and open space.

The four Build Alternatives are similar in the extent of their benefits and impacts, due to the fact that they differ for only a small portion of their alignments.

In terms of alignment, the Stoughton Alternatives would have greater benefits to the South Coast Rail communities with respect to transportation, air quality, and fewer noise impacts (particularly to Environmental Justice communities) than the Whittenton Alternatives. The Stoughton Alternatives serve more people with public transportation, more people from the South Coast communities, and provide the shortest travel time and the greatest benefit to the Freeway system. The Whittenton Alternatives would result in higher emissions of CO, NOx, VOCs, and CO2 than the Stoughton Alternatives, due to the difference in VMT and the greater reduction in VMT associated with the Stoughton Alternatives.

With the exception of having slightly less impact to aquatic resources, the Whittenton Alternative would have greater adverse impacts to the upland habitat of state-listed species and to ecological integrity as measured by the CAPS analysis. The Whittenton Alternative would have less impact to vegetated wetlands (1.0 acre) than the Stoughton Alternative, as a result of avoiding the wetlands between Route 138 in Raynham and Longmeadow Road in Taunton – including wetlands within Pine Swamp. The wetlands and vernal pools that have formed on the right-of-way between East Brittania Street and Thrasher Street (0.9 acre) represent the majority of impacts; the impacts in Pine Swamp are comparatively small, since the new rail service would be placed on existing fill (the former Old Colony Dighton & Somerset right-of-way corridor abandoned ca. 1916). Otherwise, both alternatives have the same impacts to waterways, wetlands, vernal pools and rare species habitat within the Hockomock Swamp Area of Critical Environmental Concern. The Stoughton Alternative would have less impact to ecological integrity (as demonstrated by the CAPS analysis) and to upland habitat of state-listed species

(Blandings turtles; *Emydoidea blandingii* and eastern box turtles; *Terrapene carolina*) than the Whittenton Alternative (see Table 3.3-26).

Table 3.3-26 Comparison of Aquatic and Biotic Resource Impacts

Resource	Whittenton Electric Alternative	Stoughton Electric Alternative	Whittenton Difference (amount of loss)
Waterways	1.8 ac	1.9 ac	-0.1
Wetlands (federal)	9.4 ac	10.4 ac	-1.0 ac
Wetlands and Waterways in Hockomock Swamp ACEC	1.7 ac	1.7 ac	0
Loss of Vernal Pool Habitat (fill placed in vernal pool)	0.36 ac	0.53 ac	-0.2 ac
Loss of Vernal Pool Habitat (fill placed in adjacent wetlands)	0.8 ac	1.43 ac	-0.6 ac
Rare Species Barrier Effect	3.6 miles	3.2 miles	+0.4 mile
Loss of Ecological Integrity (IEUs)- With Trestle	484.6	474.5	+10.1 IEUs

The Whittenton Alternative, because of its route through downtown Taunton and the number of grade crossings in this segment, would have greater adverse noise impacts to populated areas in general and environmental justice populations in particular. An additional 1,341 residences would experience noise impacts, of which 481 would be minority or low-income families. As shown below in Table 3.3-27, the combined moderate and severe noise impacts (including the Southern Triangle) would be substantially higher for the Whittenton Alternative—with a 93 percent increase in the noise impacts to environmental justice residences. The Whittenton Alternative would also have greater vibration impacts in environmental justice areas than the Stoughton Alternative (105 compared to 86). While vibration impacts under both the Stoughton and Whittenton Alternatives would disproportionately impact environmental justice areas in Fall River, the Whittenton Alternative would also disproportionately impact environmental justice areas in Taunton.

Table 3.3-27 Comparison of Noise Impacts—Environmental Justice Populations

Noise Impacts	Whittenton Alternative	Stoughton Alternative	Whittenton Difference
Environmental Justice Residences	842	361	+ 481 (133%)
Non-Environmental Justice Residences	1,945	1,085	+ 860 (79%)
Total Residences	2,787	1,446	+1,341 (93%)

Note: Includes both moderate and severe impacts from train operation, plus horn noise impacts.

We also find that the Whittenton Alternative would result in greater overall air quality impacts than would the Stoughton Route. The result of the Whittenton Alternative would be that more vehicles would remain on the highways and thus there would be more VMT under a Whittenton option than under a Stoughton option, resulting in greater greenhouse gas emissions.

To be sure, the greater impacts to wetlands along the Stoughton Route are not trivial; however the loss of 1.0 more acre of wetlands must be weighed against the higher impacts to biodiversity, threatened and endangered species, air quality and cultural resources associated with the Whittenton Alternative.

Thus a comparison of the comprehensive environmental impacts (including secondary and cumulative impacts) of the Stoughton and Whittenton Alternatives leads us to conclude that, overall, there is no less environmentally damaging alternative than the Stoughton Alternatives. Furthermore, in terms of propulsion technology (electric or diesel) the diesel alternative has a greater overall impact on air quality compared to the electric alternatives.

The Corps has therefore determined that there is no practicable alternative to the Stoughton Electric Alternative which would have less adverse impact on the aquatic ecosystem, and also does not have other significant adverse environmental consequences.

4.1 TRANSPORTATION

4.1.1 Introduction

As discussed in Chapter 2, *Project Purpose and Need*, the South Coast Rail alternatives seek to improve public transit service between the South Coast region and Boston, Massachusetts. This improvement would contribute towards meeting the existing and future demand for public transportation between Fall River/New Bedford and Boston and enhance regional mobility. In addition, the South Coast Rail alternatives were developed by MassDOT to be supportive of MassDOT's objective to foster smart growth planning and development strategies in the affected communities.

The transportation chapter provides a regional overview of the transportation conditions in the South Coast region. In addition, this chapter discusses transportation conditions in the vicinity of the proposed alternative corridors and proposed station locations. Grade crossings along the rail corridors associated with the alternatives are analyzed, as well as stations within the alternatives' study corridors.

Section 4.1.2 of this chapter provides an overview of the methodology for analyzing transportation conditions. Section 4.1.3 describes the existing conditions and establishes a basis for projecting future conditions without and with the alternatives (No-Build and Build Alternatives). Direct, indirect, and cumulative effects of the proposed alternatives are analyzed in Section 4.1.4 with respect to ridership demand, quality of service, vehicle miles of travel, regional mobility, traffic operations, grade crossings, and intersection and roadway traffic operations, pedestrian and bicycle accommodations, parking, and public bus transportation at each planned station within the study corridors.

4.1.2 Methodology

Given the transportation focus of the project purpose, the transportation analyses in this chapter, in addition to assessing impacts, also inform the evaluation of the alternatives in meeting the project purpose: "*to more fully meet the existing the future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts to enhance regional mobility*." In addition to analyzing the overall regional transportation conditions, safety and capacity analyses were performed for the regional roadway network, grade crossings for the potential rail corridors were analyzed, and station analyses were performed for each new proposed commuter station. The alternatives station analyses include capacity and safety analyses for the intersections near the proposed stations, traffic signal warrant analyses, and assessments for pedestrians and bicycles, parking, and public transportation. The methodology used for the transportation analyses conforms to the *Guidelines for EIS/EIR Traffic Impact Assessment*[1] and the *2000 Highway Capacity Manual.*[2]

4.1.2.1 Regional Transportation Analysis Methodology

The regional transportation network (both roadways and transit) was evaluated for both existing and future conditions with and without the South Coast Rail alternatives. Future regional transportation conditions were analyzed using four key criteria, which were applied to all alternatives, to assess their performance and impacts on the regional transportation system: ridership, quality of service, vehicle miles traveled (VMT), and regional mobility. This assessment was conducted in a manner compatible

[1] Executive Office of Energy & Environmental Affairs and Executive Office of Transportation and Construction, Guidelines for EIS/EIR Traffic Impact Assessment, July, 1989.

[2] 2000 Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C., 2000.

with previous assessment methodologies used during the alternatives analysis process described in Chapter 3, *Alternatives*.

4.1.2.2 Capacity Analysis

The assessment of traffic operations evaluates the operational qualities of the key intersections and roadway sections using the procedures documented in the *2000 Highway Capacity Manual.*[3]

Level of service (LOS) is used to denote the different operating conditions that occur on a roadway segment or at an intersection under various traffic volume loads. It is a qualitative measure of the effect of a number of factors including roadway geometry, speed, travel delay, and freedom to maneuver. LOS provides an index to the operational qualities of a roadway segment or an intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

LOS designations are reported differently for freeway sections, and signalized and unsignalized intersections. LOS for freeway sections is determined based on speed density and flow rates. For signalized intersections, the analysis considers the operation of each lane or lane group entering the intersection and the LOS designation is for overall conditions at the intersection. For unsignalized intersections, however, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. The LOS is only determined for left turns from the main street and all movements from the minor street. The overall LOS designation is for the most critical (i.e., worst) minor movement, which is many times the left–turn movement from the side street.

Freeways/Highways

The study methods outlined in Chapter 23 (Basic Freeway Segments) of the *Highway Capacity Manual*[4] (HCM) were used for the LOS analysis of the various freeway and highway segments within the South Coast Rail project study area.

LOS represents reasonable ranges in the three critical flow variables: speed, density of vehicles in the traffic stream, and the flow rate of the vehicles. Basically, as the density of vehicles increases, vehicle speed tends to decrease and the flow rate decreases correspondingly. A freeway can process approximately 2,400 passenger vehicles per lane per hour under <u>optimal</u> conditions (12-foot travel lanes, two-foot median lateral clearance, 6-foot right lane lateral clearance, level terrain, no heavy vehicles, and a driver population consisting of mostly regular users) in rural areas. The freeway capacity drops to about 2,300 passenger vehicles per lane per hour in urban areas. These volumes would result in LOS E operations, the point at which a highway is considered to be operating at capacity. Table 4.1-1 presents these criteria.

[3] 2000 Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C., 2000.
[4] 2000 Highway Capacity Manual, Transportation Research Board, National Research Council, Washington D.C., 2000.

Table 4.1-1 Level of Service Criteria–Freeway Sections

Level of Service	Traffic Conditions	Description of Operations
LOS A (best LOS)	Free Flow	Vehicles almost completely unimpeded in their ability to maneuver within the traffic stream.
LOS B	Reasonable Free Flow	The ability to maneuver within the traffic stream is only slightly restricted.
LOS C	Stable Flow	Freedom to maneuver within the traffic stream is noticeably restricted.
LOS D	Approaching Unstable Flow	Freedom to maneuver within the traffic stream is more noticeably limited.
LOS E	Unstable Flow	Operations at capacity. No usable gaps in traffic stream.
LOS F (worst LOS)	Forced or Breakdown Flow	Queues form behind breakdown point and volume-to-capacity ratio exceeds 1.0.

Note: Description based on Association of American State Highway and Transportation Officials and HCM standards.

Once the capacity of a highway is determined, the density can be calculated and the LOS can be determined. The HCM does not recommend a specific LOS for design purposes, but does present a description of the conditions associated with each LOS. The manual describes LOS C as providing for flow with speeds at or near free flow speed; freedom to maneuver within the traffic stream is noticeably restricted; lane changes require additional care and vigilance; and queues may begin to form behind any substantial blockage.

As conditions deteriorate to LOS D, the HCM describes conditions as unstable flow; freedom to maneuver within the traffic stream is more noticeably limited; and a driver experience of reduced physical and psychological comfort levels. The HCM does indicate that the higher the design LOS, the more the highway facility can absorb additional atypical amounts of traffic and still function at a satisfactory level.

Signalized Intersections

Capacity at a signalized intersection is defined for lane groups rather than for approaches or the intersection as a whole. A lane group may be a single movement, a group of movements, or an entire approach, and is defined by the geometry of the intersection and the distribution of movements over the various lanes. Capacity of a lane group is calculated as the maximum rate of flow that may pass through the intersection under prevailing traffic, roadway, and signalization conditions. The rate of flow is generally measured or projected for a 15-minute period and capacity is stated in vehicles per hour. Capacity analysis of signalized intersections involves computing volume–to–capacity (v/c) ratios for each lane group, from which an overall intersection v/c ratio may be derived.

Generally, when two opposing flows are moving during the same signal phase, one of the lane groups will require more green time than the other to process all of its volume. This lane group is defined as the “critical” lane group for the subject signal phase. The concept of a critical v/c ratio is used to evaluate the intersection as a whole, considering only the critical lane groups or those with the greatest demand for green time. Thus, if the green time has not been appropriately allocated to the various approaches, it is possible to have an overall intersection v/c of less than 1.00 (under capacity) but still have individual movements saturated within the signal cycle.

The other major concept in signalized intersection analysis is LOS, which is an index used to grade intersection operations. LOS is defined in terms of delay and ranges from LOS A (free flow conditions) to

LOS F (long delays). Delay represents a measure of driver discomfort, frustration, fuel consumption, and lost time. Specifically, LOS delay criteria are stated in terms of control delay per vehicle during a peak 15–minute period. These criteria are listed in Table 4.1-2.

Table 4.1-2 Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec)[1]
A	<10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

Source: HCM, Special Report 209; Transportation Research Board, Washington, DC, 2000.

1 Average control delay per vehicle for a peak 15–minute period.

Delay is a complex measure that depends upon a number of variables such as quality of signal progression, cycle length, allocation of green time, and v/c ratio. Of all the factors cited, v/c ratios have the least effect on delay. Thus, for any given v/c ratio, a range of delay values (and, therefore, LOS) may result. Conversely, for a given LOS, the v/c ratio may lie anywhere within a broad range. The base saturation flow rate used in the signalized intersection analysis model is 1,900 passenger cars per hour of green time per lane. This value is adjusted for prevailing traffic conditions such as lane width, left turns, right turns, heavy vehicles, grades, parking, area type, bus blockage, and left–turn blockage.

Unsignalized Intersections

LOS for unsignalized intersections is based on the assumption that major street traffic is not affected by minor street movements (i.e.; minor street traffic must wait for a gap in major street traffic). The capacity of the intersection to accommodate minor street movements is based on the amount of traffic on the major street and the configuration of the intersection. LOS is based on the average control delay, which is the total elapsed time from the time a vehicle stops at the end of the queue to the time the vehicle departs from the stop line. The average control delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. The overall LOS designation is for the most critical (i.e., worst) minor movement, which is often the left–turn movement from the side street. Table 4.1-3 presents these criteria.

Table 4.1-3 Level of Service Criteria for Unsignalized Intersections

Level of service	Control Delay per Vehicle (sec)[1]
A	<10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	>50.0

Source: HCM, Special Report 209; Transportation Research Board, Washington, DC, 2000.
1 Average control delay per vehicle for a peak 15–minute period.

4.1.2.3 Analysis Approach

The regional highway network is expected to be affected by the No-Build Alternative. The transportation capacity analyses (for the regional network and the proposed stations) are directly related to the projected ridership of the alternatives; therefore, to present the most conservative analysis, the following approach was used to determine the transportation benefits and impacts of the alternatives:

- To conservatively determine the *benefit* of the alternatives on the regional highway network, the Build Alternative with the lowest projected ridership analyzed in the DEIS (Rapid Bus Alternative[5]) was used since it would shift the fewest automobile users from a highway to a transit trip. While the Rapid Bus Alternative has been eliminated in the FEIS, it remains the most appropriate Build Alternative for analyzing the impacts on the regional highway network due to its low projected ridership, and maintains a conservative approach consistent with the DEIS. Although not specifically analyzed, the Stoughton and Whittenton Alternatives (both electric and diesel variants) would result in proportionally greater benefits to the regional highway system.

- Conversely, the Build Alternative with the highest projected ridership at each station was used to evaluate the impacts in the areas around proposed station locations. For station locations shared between alternatives, separate intersection analyses were not conducted for each alternative, because the lower projected ridership for these alternatives would result in equal or less impact than the analysis using the highest ridership.

To maintain a conservative approach consistent with the DEIS/DEIR, a specific Build Alternative was used for the analysis of each transportation study area. In some cases, Build Alternatives that have been eliminated from further consideration in the FEIS/FEIR were used as the basis for the transportation impact assessment. This approach is reasonable because the alternatives used in the analysis remain the most conservative in terms of estimating regional traffic benefits (alternative with lowest ridership) and station area traffic impacts (alternative with highest ridership). The following identifies the Build Alternative used for analysis of the various transportation study areas:

[5] As discussed in Chapter 3, the Rapid Bus Alternative evaluated in the DEIS/DEIR was eliminated from further consideration. However, the regional highway benefits assessment based on the Rapid Bus Alternative is retained in the FEIS/FEIR because it provides a conservative assessment of the regional highway benefits of the Stoughton and Whittenton Alternatives.

- The electric rail alternatives were analyzed because projected ridership is equal to or higher than projected ridership on the corresponding diesel alternative.
- Regional highway network (sections of Route 140, Route 24 and I-93)—Rapid Bus Alternative. The Rapid Bus Alternative has been eliminated from further consideration, but provides a conservative basis for evaluating the regional traffic benefits of the Stoughton and Whittenton Alternatives.
- King's Highway Station—Attleboro Electric. The Attleboro Electric Alternative has been eliminated from further consideration, but provides a conservative basis for evaluating station area traffic impacts because it had the highest ridership projection for this station of all the Build Alternatives.
- Whale's Tooth Station—Attleboro Electric. The Attleboro Electric Alternative has been eliminated from further consideration, but provides a conservative basis for evaluating station area traffic impacts because it had the highest ridership projection for this station of all the Build Alternatives.
- Freetown Station—Stoughton Electric
- Battleship Cove—Attleboro Electric. The Attleboro Electric Alternative has been eliminated from further consideration, but provides a conservative basis for evaluating station area traffic impacts because it had the highest ridership projection for this station of all the Build Alternatives.
- Fall River Depot—Attleboro Electric. The Attleboro Electric Alternative has been eliminated from further consideration, but provides a conservative basis for evaluating station area traffic impacts because it had the highest ridership projection for this station of all the Build Alternatives.
- Taunton Depot—Stoughton Electric
- Easton Village—Stoughton Electric
- North Easton—Stoughton Electric
- Taunton Station (Stoughton Alternatives Only)—Stoughton Electric
- Raynham Park Station—Whittenton Electric
- Stoughton Station (relocation)—Stoughton Electric
- Dana St. Station (Whittenton Alternatives only)—Whittenton Electric

Since there is only one set of transportation analyses for each station (worst case scenario), the results of the analyses are presented by community.

The methodology used in this chapter is standard transportation planning industry practice for the evaluation of transportation systems and infrastructure. Much of the evaluation was based on a 2030

traffic forecast with and without the Build Alternatives provided by the Central Transportation Planning Staff (CTPS) for the DEIS/DEIR. Certain key indicators such as ridership and VMT have been updated in the FEIS/FEIR for a 2035 traffic forecast. As discussed further below, the 2035 ridership analysis update results were also used to review and update the station-level traffic impact assessment where appropriate.

4.1.2.4 Traffic Growth Forecast

CTPS is the staff for the metropolitan planning organization (MPO) for the Boston region and works with the communities within the region to address issues such as transportation, land use, and economic development. The Boston Region Metropolitan Planning Organization (MPO) is responsible for conducting the federally required metropolitan transportation-planning process, and allocating federal and state transportation funds to programs and projects in the Boston metropolitan area. The MPO and CTPS function independently of MassDOT, and their activities are periodically reviewed by both the Federal Highway Administration and Federal Transit Administration.[6] MassDOT provided funding to CTPS to conduct the transportation modeling analyses for the South Coast Rail project.

The CTPS regional travel demand model was used to provide the traffic forecasts for the entire study area. This model is run using Emme software. CTPS's method of travel demand forecasting follows the traditional four steps of trip generation, trip distribution, modal split, and travel assignment. The model uses changes in population, number of households, employed residents, number of automobiles, and total employment to forecast changes in traffic over time.

Using the future No-Build model output, No-Build weekday morning and evening peak hour turning movement volume networks were created. For each municipality, a background growth rate was established based on model outputs. Table 4.1-4 shows the background traffic growth rate used in each community. These growth rates were applied to the existing traffic volumes to develop 2030 No-Build volumes. Traffic increases from specific development projects that were not included in the model were also added to the network to develop the final No-Build networks for local intersections.

Table 4.1-4 Background Traffic Growth Rate (by Community)

Community	Growth Rate[1]
New Bedford	4.1 %
Fall River	7.1 %
Freetown	18.4 %
Taunton	4.7 %
Norton	9.4 %
Raynham	8.1 %
Easton	6.9 %
Stoughton	5.0%

1 Total (aggregate) growth rate used to convert 2008 conditions to 2030 conditions

Source: CTPS Travel Demand Model.

A similar process was used to project 2030 No-Build traffic volumes on Route 24. A background growth rate was developed for each direction in each peak hour for each segment. As with local intersections, traffic from specific developments not included in the traffic model were added. Appendix 4.1–A

6 Boston Region Metropolitan Planning Organization. About the MPO. http://www.ctps.org/Drupal/mpo

provides specific information regarding the overall growth on each segment by direction and time of day.

No-Build Analysis

In order to evaluate access for the bus park-and-ride locations under future No-Build conditions with enhanced bus service, intersection capacity analyses were performed at park-and-ride driveway locations using 2030 projected traffic volumes. Traffic volumes for the 2030 design year were projected based on additional vehicle trips associated with the increased bus ridership projections provided by CTPS.

The resulting peak hour volumes were analyzed to evaluate how well the future infrastructure will accommodate the demands placed on it during the morning and evening peak hours. The analysis produces a LOS rating for each facility. The criteria for determining LOS at signalized and unsignalized intersections and on freeway sections is described above.

Station Area Analysis Methodology

Traffic Demand

Traffic demand estimated for the alternatives are based on the 2030 and 2035 ridership forecasts developed by the CTPS (see Appendix 3.2-H (2035) and Appendix 4.1-H (2030)). CTPS developed these forecasts based on a number of variables, such as observed commuter rail ridership in similar areas, magnitude of service to be provided, and future estimates of population and employment within the South Coast region and greater Boston area. All of these data were analyzed via a regional travel demand model, which ultimately provided a future ridership estimate for the proposed service. The basis for the model is documented in Appendix 3.2-G.

For the DEIS/DEIR, CTPS conducted 2030 Build model runs for each alternative by including the new bus or rail service as a travel option. The model was used to quantify the number of vehicle trips diverted from regional roadways to local roadways because of drivers and riders who change mode from passenger car to transit service. Trip generation for each station was based on projected park-and-ride (i.e., driving and parking at the station) and drop-off (i.e., being dropped off or picked up by another driver) ridership. The analyses of impacts on traffic operations are based on the peak hour park-and-ride and drop-off ridership projections for each station. The park-and-ride ridership was divided by a vehicle occupancy rate (VOR) of 1.05 to calculate the number of park-and-ride vehicles entering and exiting the stations. Two vehicle trips were assumed for each drop-off rider: one entering and one exiting the proposed station. The same basic methodology was used for the 2035 ridership forecasts (see the CTPS memorandum provided in Appendix 3.2-H).

Using the Build model outputs, peak hour turning movement volume networks were developed for each Build Alternative. The rail related trips were distributed as new traffic and assigned to the roadway network based on the distribution of trips from the travel demand model. To present a conservative analysis condition, no adjustments were made to the traffic volumes to account for diverted trips within the local street network. The peak hour volumes were then used to conduct LOS assessments for the Build Alternatives. When compared to the No-Build Alternative, the LOS assessment for the Build Alternatives will show the effect of the proposed action on transportation conditions.

Where impacts could not be avoided or minimized, mitigation was proposed and evaluated for effectiveness. Mitigation was proposed for intersections where LOS E/F conditions result because of the Build Alternatives and where LOS E/F conditions under the No-Build Alternative are notably worsened with the Build Alternatives (generally an increase in control delay of more than 10 seconds).

Safety Analysis

In order to identify crash trends, historical crash data were obtained from MassDOT Highway Division for each community for the most recent three-year period available at the time of the analysis. For each proposed station site, vehicle crashes were compiled by roadway and key intersection. Specific crash characteristics include year of crash, crash type, severity, weather, and time of day.

Crash rates are calculated based on the number of crashes at an intersection (i.e., crash frequency) and the volume of traffic traveling through the intersection (i.e., vehicle exposure) on an annual daily basis[7]. Rates that exceed the MassDOT Highway Division district or statewide average (i.e., arithmetic mean) could indicate safety or geometric issues at an intersection. The South Coast communities are location in District 5 of the MassDOT Highway Division. The District 5 average crash rate for unsignalized intersections is 0.59 crashes per million entering miles and the rate for signalized intersections is 0.84 crashes per million entering miles. The statewide crash rate is 0.66 for unsignalized intersections and 0.87 for signalized intersections.

Documentation of the crash data and crash rates is provided in Appendix 4.1- B.

Grade Crossings

An inventory of highway-railroad at-grade crossings was performed in November and December of 2008 to identify and document existing active (with freight activity) and inactive grade crossings along the following rail corridors.

- New Bedford Main Line—Cotley Junction to State Pier in New Bedford
- Fall River Secondary—Myricks Junction to Battleship Cove in Fall River
- Attleboro Secondary—portion in Taunton utilized by Whittenton Alternatives
- Stoughton Line—Canton Junction to Cotley Junction
- Whittenton Branch—Stoughton Line to Attleboro Secondary

The active rail crossings located along the Northeast Corridor were not included in the inventory. Those crossings are part of the current operating railroad and would not be altered under this project.

The existing conditions of each crossing were evaluated to determine the crossing geometry, sight distances, and roadway traffic patterns. Each rail and roadway approach was photographed and sketches were prepared to illustrate the warning systems in place and other physical features that will have to be considered during the layout and design of the proposed grade crossing.

[7] Statewide average crash rates reflect the average of crash rates contained in a database of signalized and unsignalized intersection crash rates compiled by MassDOT Highway Division, calculated for both signalized and unsignalized locations. MassDOT Crash Rate Information. 2012. http://www.mhd.state.ma.us/default.asp?pgid=content/traffic/crashRateInfo&sid=about.

Grade Crossing Incident Prediction Analysis Methodology—A highway/rail incident, as defined by the Federal Railroad Administration (FRA), is any impact between a rail and highway user at a crossing site, regardless of severity. This includes motor vehicles and other highway / roadway/ sidewalk users at both public and private crossings. From 2002 to 2011 for the 333 active at-grade crossings the MBTA operates, an average of three incidents occurred per year (0.99 incidents per million train miles). In comparison, the national average is 72 incidents per year or 1.57 incidents per million train miles.

In order to establish what may be the incident rate for future conditions, the FRA's Office of Safety Analysis has developed a Web Accident Prediction System (WBAPS), which is used to calculate the probability that an incident will occur in any given year. This system generates incident reports for public highway/rail intersections for a state, county, city, or railroad and ranks them by predicted collisions per year. A train incident is defined by the FRA as an event involving on-track rail equipment that results in monetary damage to the equipment and track above a certain threshold. Incident predictions are based on a current inventory of at-grade crossings and collisions from 2002 to 2011. Using the WBAPS, incident predictions were calculated for each town along the South Coast Rail project and compared to similar rates estimated for the entire MBTA system.

Gate Closure

The impact of the grade crossings on traffic operations requires the calculation of the amount of time the roadway would be blocked. In accordance with standard practice, it is assumed that the gate system would close 30 seconds prior to the train's arrival at the grade crossing and for 15 seconds after the train clears the crossing. This time is estimated by dividing the approximate length of the train by the approximate speed of the slowest train expected at that crossing. In most cases where the rail crossing is perpendicular to the roadway, the sum of these components yields the total time (60 seconds) that the roadway is blocked. A 70 second gate delay time was used for unusually wide or skewed crossings.

For crossings that are located within 500 feet of a station platform, the gates would operate differently depending on the direction of travel. The delay for a train passing through the crossing before stopping at the station would be 60 seconds, as defined above. However, as a safety measure, the gates must also be activated as a train pulls into a station prior to reaching the crossing. The train then stops at the station to drop off or pick up passengers and then continues through the crossing. The timing for this situation was determined based on:

- As the approaching train is detected, the gates would close.
- When the train stops at the platform the gates would open.
- The gates close again as the train leaves the station (it is estimated that approximately four cars would be able to clear the crossing while the train dwells in the station).
- After the train passes through the crossing the gates reopen a final time.

The total gate delay time is estimated to be 150 seconds. Since this time also includes station dwell time, the projected delays and queues were reduced to reflect the estimated four cars that would clear the crossing during the station dwell time.

Determination of Vehicle Volumes

Where available, existing traffic volume data at grade crossing locations were obtained from the MassDOT Highway Division. These data were supplemented by counts collected as part of the traffic analysis for the proposed project. The 2030 morning and evening peak hour traffic volumes were developed for each grade crossing by applying the annual growth rates obtained from the CTPS regional transportation demand model.

Traffic Queue and Delay Calculation

The peak direction traffic volumes were converted to an average arrival rate by dividing the hourly volume by the number of seconds in an hour (3,600). By applying the arrival rate to the total time that the roadway was blocked, an average queue estimate was developed. Assuming a random arrival of vehicles at the crossing, the average delay per stopped vehicle was estimated based on gate closure time plus the startup time for the vehicles in the queue. An average start up time of two seconds was used, representing a four second start up time for vehicles in the beginning of the queue and zero seconds toward the back of the queue. The average delay is therefore equal to one-half of the time that the roadway is blocked plus two seconds per vehicle for one-half of the average queue.

Determination of Impact

After the average queue was calculated, impacts of the queue on nearby intersections were determined. A value in the range of 20 to 25 feet per vehicle is generally used to estimate the length of queues. This length includes the length of the vehicle and the spacing between queued vehicles. For this analysis, the total number of vehicles was multiplied by 25 feet per vehicle to determine the total average length (in feet) of the queue.

Inactive or Abandoned Railroad Rights of Way

In locations where reactivation of inactive or abandoned railroad rights-of-way are proposed, the analysis provided includes more detail with respect to traffic flows and average delays. This is necessary to determine the projected impacts of gate closures due to the absence of physical gate closure data.

4.1.2.5 Stations

As shown in Figure 1.4-1, the commuter rail alternatives include potential commuter rail stations within New Bedford, Freetown, Fall River, Taunton, Easton, Stoughton, and Raynham. Intersections within the seven communities were selected for safety and traffic operation analyses based on the proposed locations of the new or relocated commuter rail stations.

Since boardings at existing commuter rail stations located near the end of the existing Stoughton Commuter Rail Line are not expected to increase as a consequence of the alternatives, no traffic analyses, beyond the identification of new grade crossing locations, were completed for existing stations or municipalities with existing stations.

Roadway and Intersection Inventory

A comprehensive field inventory of major roadways and key intersections was completed for each commuter rail station study area. Field reconnaissance included an inventory of roadway geometry, observed vehicle speeds, signalization (where applicable), other traffic control, and nearby land uses. Documentation of the intersection inventory field work is provided in Appendix 4.1-C. Detailed roadway and intersection descriptions are provided in Appendix 4.1-D.

Traffic Volume Data Collection

Traffic volume data were collected in September and October 2008 for roadways and critical intersections serving each of the proposed rail stations. This data included automatic traffic recorder (ATR) counts and manual turning movement counts (TMCs). ATRs were collected along major roadways to provide an understanding of daily and peak hour traffic flows in the vicinity of each potential commuter rail station site. Two–hour TMCs were conducted at key intersections during the weekday morning and evening commuter peak periods. Vehicles, bicycles, and pedestrians were counted. All TMCs were conducted midweek (Tuesday through Thursday) to capture traffic count data that depict typical weekday peak conditions. The TMCs were balanced, and rounded to form the traffic volume networks used to evaluate existing traffic operations. To determine whether or not it was necessary to seasonally adjust the recorded traffic volumes, historical traffic count data from the following MassDOT Highway Division permanent count stations were reviewed:

- Randolph, Route 24 south of I-93
- Raynham, I–495 north of Route 24
- Raynham, I–495 south of Route 24
- Freetown, Route 140 at the New Bedford city line
- Taunton, Route 24 north of Route 140
- Fall River, I-195 west of Route 24

Based on observed data from these locations, traffic volumes for September and October are generally 1 to 8 percent higher than the yearly average. Consequently, the actual traffic counts were not adjusted to reflect any seasonal difference in traffic volumes; and therefore represent a slightly higher than average condition.

Documentation of the traffic volume data collection is provided in Appendix 4.1-E.

Traffic Signal Warrant Analysis

The Manual of Uniform Traffic Control Devices (MUTCD) defines a traffic signal warrant analysis as an engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of an intersection performed to determine whether installation of a traffic control signal is justified at a particular location. The study includes an analysis of factors related to the existing operation and safety at the intersection in question, the potential to improve these conditions, and standard criteria which could necessitate the installation of a traffic signal, known as "warrants." The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.[8]

Peak hour signal warrant analyses were conducted at study area intersections in conformance with the MUTCD[9] standards. For the purposes of this analysis, peak hour traffic signal warrants were evaluated for unsignalized intersections that exhibit poor traffic operations and would decline further as a result of the proposed project. If an unsignalized intersection does not meet the peak hour traffic signal warrant

[8] Chapter 4C. Traffic Control Signal Needs Studies. Manual of Uniform Traffic Control Devices (MUTCD) Federal Highway Administration Washington, DC 2003.

[9] Manual of Uniform Traffic Control Devices (MUTCD) Federal Highway Administration Washington, DC 2003.

based on projected 2030 traffic volumes, no additional analysis would be necessary. All site driveway locations were also evaluated for traffic signal installation.

Locations meeting traffic signal warrants under the peak condition would be evaluated for four and eight-hour traffic signal warrants as part of the preliminary design process. Meeting a traffic signal warrant indicates that a traffic signal could be placed at a particular location; however, satisfaction of a traffic signal warrant does not in itself require a traffic signal be installed. Locations where traffic signal installation is considered an appropriate mitigation measure are discussed later in this section. Documentation of the preliminary traffic signal warrant analysis is provided in Appendix 4.1-F.

Pedestrians and Bicycles

The travel demand model was also used to project total pedestrian and bicycle volume at each planned station for the Build Alternatives. For each transportation analysis zone (TAZ) within the regional model, CTPS provided the number of pedestrians and bicyclists using transit and the specific station they would access. The pathways of travel between zones and each station were mapped and pedestrians and bicyclists were assigned to routes accordingly. Bicycle accommodations were evaluated qualitatively for the Build Alternatives with respect to their ability to serve projected users and any projected impacts from project related traffic and planned or proposed roadway improvements. Pedestrian/bicycle volume networks for all alternatives can be found in Appendix 4.1-G.

Parking

The parking assessment for stations associated with the alternatives compares the planned number of parking spaces to the projected peak parking demand and identifies any existing parking supply that may be affected by the proposed project. Peak parking demand at each station was projected based on the daily passenger boardings determined by the CTPS travel demand model. For the purposes of this analysis the peak parking demand is equal to the number of passengers who would drive and park at the station prior to boarding the train. No reduction in parking demand was taken in order to account for carpooling. Locations where projected demand for parking exceeded the planned parking supply were identified. There were no parking demand analyses of the Battleship Cove and Easton Village stations because no parking is planned for either location.

The existing parking supply in the vicinity of each proposed station location was qualitatively evaluated in order to determine whether any existing parking is vulnerable to impacts due to the proposed project. Areas that have potential vulnerability have been identified and steps to mitigate impacts noted if applicable.

Public Bus Transportation

Existing bus services near the planned stations were reviewed to determine if route or service adjustments could be made to provide good connections between local transit services and commuter rail service. Using the CTPS travel demand model, potential bus route adjustments to provide direct service to planned stations were evaluated. Limited bus transit activity is anticipated at most stations. More substantial bus activity is projected at the Whale's Tooth station due to proximity to regional bus transit hubs. Trip generation characteristics for this station are provided in Appendix 3.2-H.

4.1.3 Existing Conditions

This section presents the Affected Environment (Existing Transportation Conditions) for the South Coast Rail project. An overview of the South Coast region, including ridership demand, quality of service, vehicle miles of travel, and regional mobility is presented. In addition, existing traffic operations were analyzed for the highways and intersections within the South Coast region, existing grade crossings for the proposed rail corridors are identified, and proposed stations are analyzed. The existing station analyses include an inventory of roadways and intersections, existing traffic volumes, crash analysis summary, and traffic operations analysis.

4.1.3.1 Regional Overview

Quality of Service

The existing transportation system serving the South Coast region has inadequate capacity, leading to lack of regional mobility, between the South Coast region and Downtown Boston and within the South Coast region itself. This is due in part to the relative lack of public transit connections between New Bedford/Fall River and Boston and between South Coast cities (New Bedford, Fall River, Taunton and others).

In this regard the South Coast region is severely underserved relative to other regions. This is partially due to the absence of commuter rail, which in other regions provides intra (within) regional connectivity (mobility), partially as a byproduct of interregional connectivity with Boston.

The inadequacy of public transit service in the South Coast region is reflected in several aspects. The availability of public transit service in absolute terms and compared to other regions (especially those that have a large commuting segment to downtown Boston) is limited, and the quality of transit service as expressed in travel time and frequency of service is poor, especially during the peak hours. The geographic availability of transit service to people in the region is also relevant in terms of access to employment opportunities and services, including education and healthcare. In addition to transit services between the South Coast region and Boston, transit services within the South Coast region are also relevant. An indicator of quality of transit service is the MBTA's Service Delivery Policy.[10] This policy identifies minimum frequency of service levels that provides the guidelines by which the MBTA maintains accessibility to the transportation network within a reasonable waiting period. The minimum frequency of service standards is the minimum frequency that must be maintained in a service. For commuter rail and commuter bus minimum frequencies should provide three trips in a peak direction during the AM and PM peak periods.

Existing transportation in the South Coast region is predominantly auto-oriented and transit services within the South Coast region are limited to bus and demand-response services operated by regional transit authorities and private carriers. Most of the commuter trips from the South Coast region to the Boston market are in single occupant vehicles. Public transit accounts for a minor proportion of work trips in the service area. To a large extent, this can be attributed to the lack of public transit alternatives other than privately-operated bus service. As discussed below, many communities in the South Coast region lack public transit facilities other than private bus services and major population centers are as

[10] MBTA's Transit Service Policy is similar to other service delivery policies and standards from regional transit agencies, such as Los Angeles County MTA, Detroit DOT, Washington, D.C. MTA, Chicago Transit Authority, and others.

much as 25 miles from existing commuter rail stations. All commuter rail stations are located outside the South Coast region and are approaching capacity.

Bus Service

Local bus public transit within the South Coast region is provided in Taunton by Greater Attleboro Taunton Regional Transit Authority (GATRA) and in New Bedford and Fall River by Southeastern Regional Transportation Authority (SRTA). GATRA also operates intercity bus service between Taunton and Providence, Rhode Island.

Bus service to Boston from the South Coast region including the cities of New Bedford, Fall River, and Taunton is limited to private carriers (Figure 2.2-1). Private carriers also connect New Bedford, Fall River, and Taunton with each other and with Providence, Newport and points beyond. Bus service from the South Coast region to Boston uses the regional roadway system and is therefore subject to the same congestion and safety problems on the highway system as other vehicles, resulting in long and unpredictable travel times. The existing bus service between the South Coast region and Boston fails the MBTA's Service Delivery Policy. The bus service is also substantially more expensive than MBTA commuter rail services over similar distances, creating an additional constraint on usage of bus service, especially for lower income groups. Some bus service exists to commuter rail stations outside the South Coast region; however the transfer between two transit services increases overall travel cost and overall travel time, rendering it less attractive.

In addition, existing express bus services within the South Coast region are limited to a few stops in order to realize a total travel time competitive with automobiles. Serving additional communities with these bus services would substantially slow service to unacceptable levels, which would result in fewer riders. The second constraint that limits intraregional connections is bus capacity. In order to attract riders, existing bus services seek to minimize headway (maximize frequency) while operating at or near capacity almost from their initial point of departure, with very limited or no intermediate stops within the South Coast region. Existing bus services thus operate as exclusive routes with few in-between stops and thus do not provide substantial interregional connectivity.

While the current bus service plays an important role, especially as it is the only regular transit service between the South Coast region and Boston, its use is limited, reflecting constraints related to travel time, and service frequency.

Vanpools/Carpools

Vanpools in communities of the South Coast region are provided through MassRides, a program of MassDOT. Although relevant as a complementary service vanpool and carpool travel times are severely impacted by slow travel speeds on the expressway and secondary roads.

Park-and-Ride

Park-and-ride facilities and carpool/vanpool services are offered along the primary regional travel corridors in the South Coast region. Park-and-ride lots are associated with car-pooling, van-pooling, or private bus service to Boston. There are nine public park-and-ride lots located in the South Coast region, as illustrated in Figure 4.1-1, of which five are located along the primary roadways from the region to the Boston metropolitan area and four not in the immediate vicinity of the primary access routes to Boston. In addition, three private park-and-ride lots in the South Coast region are available exclusively

for customers using the private bus services to Boston. Three public park-and-ride lots are outside the South Coast region, but still along the Route 24 access corridor to Boston. Park-and-ride facilities as feeders for bus and car-pooling and van-pooling services are limited in their effectiveness as a transportation connection with Boston, due to the inconvenience of transfers and travel times associated with the congested roadway system, both in terms of traveling to the park-and-ride facility and travel from the park-and-ride facility to Boston.

Commuter Rail

Many communities within the South Coast Rail study area do not currently have commuter rail service. The nearest commuter lines (MBTA's Providence Line and Middleborough Lines) terminate on the northwest and northeast edges of the South Coast region. Starting in May 2013, MBTA, in cooperation with the Cape Cod Regional Transit Authority, established a seasonal weekends-only service known as the Cape Flyer, extending the Middleborough line from its current terminus in Middleborough to Hyannis. However, this service is limited to three round-trips per week, all on weekends, and thus serves weekend tourists rather than daily commuters between Boston and the South Coast. In fact, the three major cities in the South Coast region; Taunton, Fall River, and New Bedford are the only cities within 50 miles of Boston that are not served by passenger rail. The closest commuter rail stations are Middleborough/Lakeville (MBTA Middleborough Line), and Attleboro Station and Providence Station (MBTA Providence Line). The Middleborough Line serves areas east of the South Coast region and southeast of Boston, with stations in Lakeville and Bridgewater, while the Attleboro/Providence and Stoughton Lines serve communities to the north and west of the South Coast region. The Attleboro and Mansfield Stations are the primary access points on the Attleboro/Providence Line. The Stoughton Station serves as the primary access point on the Stoughton Line. All of the communities in the heart of the South Coast region, are outside a 6-mile access radius of these stations, and some, including the major population centers such as New Bedford and Fall River (combined population approximately 182,000), are more than 20 miles and up to 25 miles from the nearest train station. Due to their distance to the nearest commuter rail station the existing commuter rail lines to Boston are difficult for residents to access, especially for those living in Taunton, Berkley, Freetown, Fall River, and New Bedford. Travel to these stations is also limited to local secondary roads, which further increases travel time.

For those commuters in the South Coast region who live closer to commuter rail stations outside the South Coast region, constraints to the usage of the existing stations are posed by station parking and system capacity issues, as exemplified by the seat utilization ratio on the Providence line in Table 4.1-5. Commuter rail services are currently approaching or over capacity and system capacity is limited by parking capacity at these stations. Commuter rail parking lots in Attleboro, Mansfield, and to a lesser degree in Stoughton are already heavily utilized, as shown in Table 4.1-6 and are not positioned either within the regional road network or within their local (developed) context to handle projected future growth. In addition, some peak hour trains already experience heavy passenger loads, which was especially evident before the recent economic downturn. Therefore, the existing commuter rail service, although within reach of some communities in the South Coast region, is not sufficient to handle the anticipated growth in ridership.

Table 4.1-5 Ridership on Providence and Stoughton Lines

Line	AM Peak Passengers	AM Peak Seating Capacity	AM Peak Seat Utilization*
Providence	11,017	8,532	129%
Stoughton	2,771	3,558	78%

Sources: MBCR Ride Check December 2006, MBTA South Side Equipment Schedule
* Assumes all passengers continue to South Station, Stoughton and Providence/Stoughton Lines.

Table 4.1-6 Parking Utilization at Providence and Stoughton Lines Stations

Station	Occupied Spaces	Total Spaces	Utilization
Providence Line+			
Providence	N/A	330	N/A
South Attleboro	918	992	93%
Attleboro	756	770	98%
Mansfield	812	805	101%
*Stoughton Line**			
Stoughton	350	441	79%

\+ MBTA, 2000
* OCPC 2004

In summary, commuter rail service currently does not extend into the South Coast region, making access to commuter rail difficult for area residents. The relatively small ridership share of South Coast commuters using commuter rail services terminating outside the South Coast region is low, which reflects the constraints associated with this service for South Coast region commutes to Boston.

Vehicle Miles Traveled

VMT measures the extent of motor vehicle operation or the total number of vehicle miles traveled within the study area on given day. It is an important gauge for air quality and greenhouse gas emissions, as emissions of air pollutants and greenhouse gases are related to the distance traveled by automobiles (and to a lesser degree congestion). Daily regional automobile VMT is expected to grow from 109,926,000 under existing conditions to 118,894,000 by 2035 under the No-Build Alternative (based on updated modeling conducted by CTPS in 2012, see Appendix 3.2-H).

Regional Mobility

In addition to the lack of one-seat transit rides from one municipality to another within the South Coast region and adjoining regions, the lack of regional mobility is reflected by poor connectivity between the South Coast region and Boston.

The current transportation system serving the South Coast region is primarily a highway system composed of major, limited access state routes, regional highways, and local roadways (Figure 1.2-1). There are five major highways in the South Coast Rail project study area providing the primary access within and to adjacent regions:

Route 24 is the main north-south highway between the South Coast region and the metropolitan Boston area. This limited access facility begins at the Rhode Island state line at Tiverton, connects with I-195 on

the east side of Fall River, and terminates at I-93/Route 128. It passes through Fall River, Freetown, Berkley, Taunton, and Raynham within the projects' study area.

Route 140 is a limited access highway connecting New Bedford and Taunton. It passes through the South Coast region communities of New Bedford, Freetown, Lakeville, and Taunton. The limited access portion of Route 140 ends at Route 24 in Taunton, providing an important link between the South Coast cities and towns of New Bedford, Dartmouth, Mattapoisett, Acushnet, and Taunton. Route 140 continues north from Taunton, roughly paralleling I-495, but not as a limited access facility.

Route 79 is a limited access segment approximately 4 miles long, beginning at I-195 on the west side of downtown Fall River and ending at Route 24 in northern Fall River. Route 79 provides a link from downtown Fall River and the communities located along I-195 west of Fall River to Route 24.

Route 138 is primarily a two-lane facility that passes through the South Coast region communities of Fall River, Somerset, Dighton, and Taunton, and provides access north to Raynham, Easton, and Stoughton. It connects with I-195 and the limited access segment of Route 79 in Fall River, the non-access controlled section of Route 140 in Taunton, and I-495. Route 138 also provides access to the MBTA's existing Stoughton station and planned stations in Easton and Raynham.

I-495 is a circumferential highway around metropolitan Boston that runs primarily northwest/southeast in the South Coast region, linking Route 24 to the I-90 and I-95 corridors. This facility provides access for a portion of the region to MBTA commuter rail stations in Middleborough/Lakeville and Mansfield. I-495 passes through Wareham, Rochester, Middleborough, Raynham, Taunton, and Norton, connecting with I-95 near the Mansfield/Foxborough line and Route 24 in Raynham.

Traffic generated within the South Coast region must travel on I-93/Route 128 and I-93/Route 3 (Southeast Expressway) to reach downtown Boston. Route 128 is Boston's inner circumferential highway that provides access to much of the metropolitan Boston region. Following I-93 north/Route 128 south from Route 24 leads to I-93/Route 3 (Southeast Expressway) and downtown Boston, approximately 8 miles from the I-93/Route 128/Route 3 interchange in Braintree. Following I-93 south/Route 128 north from Route 24 leads to I-95 approximately 3 miles to the north, and to I-90 approximately 15 miles to the north. I-90 (Massachusetts Turnpike) provides the only limited-access highway to Boston from west of the city. Route 128 and the Southeast Expressway are heavily congested roadways, particularly during peak periods.

Traffic volumes on Route 128 are approximately 135,000 vehicles per day north of Route 24 (towards I-95) and 167,000 vehicles per day to the south (towards I-93/Route 3). I-93/Route 128 provides four general purpose travel lanes in each direction between Route 24 and I-93/Route 3. North of the I-93/Route 3 interchange in Braintree, four general-access lanes and one high occupancy vehicle (HOV) lane in the peak direction and three general access lanes in the non-peak direction are provided during peak periods. During off-peak periods, the roadway provides four lanes in each direction through Southampton Street Massachusetts Highway Department operates HOV lanes on I-93/Route 3 from just south of the Furnace Brook Parkway exit in Quincy to the Columbia Road exit in Dorchester. As of 2009, the HOV lanes are open to all two-person carpools. Traffic volumes on I-93/Route 3 are as high as approximately 191,000 vehicles per day.

Freight Operations

The existing freight service for the South Coast region is shared between Mass Coastal and CSX. CSX dispatches several lines from its Selkirk, New York control office. The MBTA transferred dispatching of the Middleborough Secondary to CSX in 2009. There are several secondary tracks referred to as the Framingham (portion of track from Framingham to Mansfield), Attleboro (area of track from Attleboro side track to Cotley Junction), and the Middleborough (from Cotley Junction to the Middleborough branch of the Old Colony Railroad), as well as the New Bedford and Fall River branches.

CSX transferred ownership of the Fall River Secondary and New Bedford Main Line to MassDOT in June 2010. CSX simultaneously transferred the freight operating rights along these corridors to Mass Coastal. Currently, the existing freight service for the Fall River Secondary and New Bedford Main Line is therefore owned by the Commonwealth of Massachusetts and operated by Mass Coastal, while the Attleboro Secondary is owned by the Commonwealth of Massachusetts and operated by CSX. Freight service operates at maximum authorized speed of 40 mph with multiple civil and operational speed restrictions. All operations on these secondaries are under Dark Territory Control (no vital wayside signaling system). Figure 1.2-1 shows the existing rail transportation system, and Figure 3.2-10 shows the ownership of the rail segments.

CSX Freight Operations

The existing long haul freight service in this region is provided by CSX. CSX runs a late night/early morning train from Framingham to Attleboro where the train makes a run-around (reversing) operation and heads North on the NEC to Canton Junction (if warranted by customer demands) or east towards Cotley Junction to exchange cars with Mass Coastal. The train then continues on to Middleborough, exchanging cars with CSX local trains at Middleborough Junction. During this operation the Middleborough Secondary is often impeded as CSX uses the secondary as a switching lead, a track used by the switch engine while sorting railcars that gives it room to pull back while switching.

Additionally, CSX runs a freight train north to exchange cars with the Fore River Railroad at Greenbush Junction as well as to service sidings along the Middleborough branch of the OCRR. This movement occurs once per weekday between Braintree and Middleborough.

CSX runs this train during daylight hours in response to community concerns. This constrained operation is very difficult to complete at times trying to fit switching operations in small windows so as not to conflict with the MBTA passenger service.

Mass Coastal Freight Operations

Locally in the South Coast Region, Mass Coastal services both the New Bedford Mainline and the Fall River Secondary from the Cotley siding track north of Cotley Junction, where it interchanges with CSX for the South Coast Region. New Bedford is serviced 2 days per week, except during “sludge season,” when it is serviced three times per week, typically Tuesdays and Thursdays. “sludge season” refers to annual dredging in the New Bedford Harbor, the duration of which varies from year to year.[11] Fall River is serviced three days per week, typically Mondays, Wednesdays, and Fridays. According to Mass Coastal, the dredging activities in New Bedford require few, if any, additional trains. The tracks from Cotley and

[11] The “sludge season,” refers to the USEPA’s dredging project in New Bedford Harbor. According to the Water Quality Monitoring Summary Reports prepared for the USACE, the dredging seasons in 2010 through 2012 went from June to September.

Myricks Junctions southward are in poor shape, and Mass Coastal trains are typically unable to safely operate at speeds exceeding 10 mph.

Freight activity on the New Bedford Mainline track includes the Watuppa Line, which runs east/west between New Bedford and Westport. Approximately half of the Watuppa Line is owned by Bay Colony Railroad and the other half by MassDOT (currently operated by Bay Colony Railroad for Mass Coastal). The interchange point for Bay Colony and Mass Coastal is at the Watuppa Wye between Nash Road and Deane Street in New Bedford.

The majority of the existing freight traffic on the Fall River line is from/to Wharf Yard at Battleship Cove.

In Taunton, Mass Coastal operates the Dean Street Industrial Track, which runs approximately 1.5 miles from Weir Junction in Taunton north to Longmeadow Road near the Taunton/Raynham line. MCRR picks up/drops off cars for the Dean St. line at the Cotley siding track, the interchange point with CSX. In addition to the "main" track on the Dean Street line there are two double ended storage tracks adjacent to the Gallo Construction property, which occupies land between the Dean St. line and the CSX mainline to Attleboro. All three tracks are heavily used on a daily basis for switching and storage purposes to manage the large number of rock salt cars inbound and outbound from Gallo. Daily moves between Cotley Junction and the Dean Street line are required to deliver carloads and to retrieve empties.

4.1.3.2 Traffic Operations Analysis

This section presents information regarding existing traffic volumes, safety, and operational conditions along the highways or limited access freeway facilities in the study area. This section also provides existing safety and traffic operations information for the critical intersections at two existing park-and-ride lots. These park-and-ride lots, located in West Bridgewater and New Bedford, are important nodes as part of the No-Build (Enhanced Bus) Alternative. Based on field observations of current intersection operations and driveway configurations, these two locations appeared to have possible safety or capacity issues: The Mt. Pleasant Street park-and-ride facility in New Bedford and the Route 106/Route 24 park-and-ride access roadway intersection in West Bridgewater. These two unsignalized locations were analyzed further as they contain substantial parking capacity, exhibit some peak hour delay, and are located on higher volume collector and arterial roadways. The other park-and-ride locations were not studied for operations, as they appear to have less delay and or safety concerns.

Existing Traffic Volumes

Traffic volume data for the regional highway study area were collected in September and October 2008 and included ATRs. The location of all the traffic counters is shown in Figure 4.1-2.

Table 4.1-7 presents a summary of the recorded ATR volumes on a daily basis and during peak periods. Interstate 93 in Quincy carries approximately 175,000 vehicles per day (vpd) on a typical weekday, with approximately 7,800 northbound vehicles during the weekday morning peak hour and 7,300 vehicles during the weekday evening peak hour. Daily traffic volumes along Route 24 gradually increase from Fall River to Randolph more than doubling from approximately 49,000 vpd to 115,000 vpd.

To evaluate the traffic associated with No-Build (Enhanced Bus) Alternative, the TMCs were conducted during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak periods at the two park-and-ride lot study area intersections where such bus services would be provided to commuters driving to these lots These traffic volumes were reviewed, balanced, and rounded to the nearest five to develop the traffic volume networks used to evaluate existing traffic operations in the

vicinity of the park-and-ride lots associated with the future bus services. Peak hour traffic flow networks for the existing traffic to and from these Park-and-Ride bus stops during weekday morning and evening peak hours are shown in Figures 4.1-3 and 4.1-4 for the summer and fall, respectively.

Table 4.1-7 Existing Traffic Volumes—Regional Highways

Location (Figure 4.1-2 number)	ADT [1]	Direction	Weekday Morning Peak Hour	Weekday Evening Peak Hour
1. Route 24 at Fall River-Freetown Line	48,650	NB	2030	1890
		SB	1770	2590
2. Route 24, south of Route 140	41,070	NB	1110	1250
		SB	1355	2875
3. Route 24, north of Route 44	74,810	NB	3930	2475
		SB	2110	3860
4. Route 24, north of I-495	96,420	NB	5260	3435
		SB	2630	4755
5. Route 24, north of Route 123	101,820	NB	5405	3255
		SB	2350	5445
6. Route 24, south of Pond Street	109,840	NB	5355	3330
		SB	3070	6010
7. Route 24, south of I-93	115,440	NB	5100	2770
		SB	3400	6110
8. I-93, south of Furnace Brook Pkwy	175,230	NB	7840	5310
		SB	5085	7255
9. I-93, south of Route 3	166,670	NB	5955	4750
		SB	6980	7375
10. Route 138, south of Bay Street	20,660	-	1345	1565
11. Route 138, south of Route 106	17,640	-	1400	1555
12. Route 140, north of Hathaway Road	51,580	NB	2015	2085
		SB	2160	2225
13. Route 140, south of Route 24	32,580	EB	830	1740
		WB	1595	1060

1 average daily traffic volume expressed in vehicles per day

Regional Growth

As the population in the South Coast Region and employment in the Boston area have grown, the demands on the roadway system linking Southeastern Massachusetts to the rest of the region have increased. Traffic volumes on the limited-access state routes linking the South Coast Region to the employment centers of Boston have been growing over the past decade, as shown in Table 4.1-8. Overall, traffic volumes on the roadways in the South Coast Region have grown at an annual rate of two to three percent over the past decade. However, traffic volumes have grown even more rapidly in some areas.

The largest increases in traffic volumes have been on Route 24 in Raynham and Taunton, where the traffic volumes have had annual increases of 4.1 and 5.0 percent respectively. Traffic volumes on Route 140 in Taunton have been increasing at an annual rate of 2.2 percent. Route 128 and I-93 (the Southeast Expressway) exhibit relatively stable traffic volumes. They are already some of the most congested highways in the state and traffic volumes on these roadways are at or near capacity for long portions of

the day, making further increases in average daily traffic volumes infeasible. The minor decrease in traffic on portions of I-93 may reflect changes in motorist route choices due to Central Artery/Tunnel project construction, and demand reductions from the Route 3 corridor due to the restoration of the Old Colony Commuter Rail service.

Table 4.1-8 Average Daily Traffic Volume Growth

	Average Daily Traffic (vehicles per day)			Growth Rate (percent)		
Count Location	**Historic**	**Recent**	**Change**	**Total**	**Period**	**Annual**
Route 24						
Randolph (south of Route 128)	96,601	115,440	18,839	20	1989-2008	0.9
Avon (south of Pond Street)	90,196	109,840	19,644	22	1989-2008	1.1
Raynham (north of Route 44)	42,168	74,810	32,642	77	1989-2008	3.1
Taunton (north of Route 140)	37,734	68,109	30,375	80	1989-2005	3.7
Freetown (at Fall River city line)	29,822	48,650	18,828	63	1989-2008	2.6
Fall River (south of Wilson Road)	19,000	26,700	7,700	41	1989-2003	2.5
Route 140						
Taunton (south of Route 24)	23,133	32,580	9,447	41	1989-2008	1.8
Freetown (north of New Bedford city line)	25,250	32,447	7,197	29	1989-2004	1.7
New Bedford (north of Phillips Road)	23,449	32,400	8,951	38	1989-2005	2.0
New Bedford (north of Hathaway Road)	35,631	51,580	15,949	45	1989-2008	2.3
Route 79						
Fall River (north of Hermon Street)	16,460	25,400	8,940	54	1989-2004	2.9
I-95						
Foxborough (north of I-495)	57,800	93,200	35,400	61	1997-2003	8.2
Canton (south of I-93 / Route 128 / Route 1)	80,800	98,700	17,900	22	1997-2004	2.9
I-495						
Mansfield (south of Route 140)	37,400	69,900	32,500	87	1996-2005	7.2
Taunton (south of Bay Street)	40,400	69,100	28,700	71	1996-2005	6.1
Raynham (north of Route 24)	48,277	67,098	18,821	39	1996-2005	3.7
Middleborough (between Route 44 and Route 18)	35,100	56,100	21,000	60	1996-2005	5.4
I-195						
Fall River (west of Route 24)	66,053	81,339	15,286	23	1996-2005	2.3
New Bedford (east of Route 140)	55,300	73,500	18,200	33	1996-2005	3.6
Route 3						
Braintree (north of Union Street)	130,000	133,600	3,600	3	1996-1997	3.0
Route 128 / I-93 / I-95						
Quincy (north of Route 28, east of Route 24)	168,955	166,670	-2,285	-1	1989-2008	-0.1
Canton (at Dedham town line, west of Route 24 / I-95	128,537	134,684	6,147	5	1989-2004	0.3
Route 3 / I-93 (S.E. Expressway)						
Boston (north of Granite Avenue)	174,612	190,993	16,381	9	1999-2004	1.7
Boston (north of Southampton Street)	176,322	174,284	-2,038	-1	1989-2006	-0.1

ADT Average Daily Traffic (vehicles per day)
Source: Massachusetts Highway Department

The increases in traffic volumes on the principal highways linking the South Coast region to downtown Boston have led to deteriorating LOS on these roadways, especially during peak periods. Delays on these roadways are now common and have become worse over the past decade. These delays are especially prevalent on Route 24 as it approaches Route 138/I-93 in Randolph. Increases to peak-hour volumes of up to 3,500 and 4,000 vehicles per hour on Route 24 and on I93/Route 138 in Braintree in Raynham, respectively, have led to deterioration of LOS down to F on these major roadways, which are intended to relieve the local roadways from regional traffic. Several mitigation measures have been implemented on I-93 to reduce congestion (high-occupancy vehicle lanes, improved MBTA Red Line service, and Old Colony Commuter Rail service). However, this highway continues to operate at poor levels of service, resulting in substantial congestion. There are no roadway alternatives to the use of Route 24 and I-93, and no mitigation measures are planned to reduce congestion.

The lack of adequate capacity of the roadway system and the resultant reduction in LOS is anticipated to become even more problematic with the increased demand for transportation resulting from the growth of the South Coast region, especially as commuters living near Boston are moving away to areas further from the metropolitan core. Southeastern Massachusetts has been one of the fastest growing areas in the Commonwealth. Between 1960 and 2000, this area experienced a growth rate of 31 percent. Between 1960 and 1990, this area had an annual growth of over 2,500 people per year from a base population of 343,353 to its 1990 population of 430,846. Growth slowed somewhat between 1990 and 2000, to an annual growth of approximately 1,950 people per year. These figures translate to a growth of 4.5 percent between 1990 and 2000, which is greater than the growth rate of the Commonwealth as a whole. Each 10,000 new residents coming into the area are expected to generate a need for 3,500 new residential units, and are predicted to generate 27,650 new vehicle trips per day, further degrading the level of service provided by the regional transportation system.

Furthermore, as described in greater detail in the next sections, the LOS of the roadway system connecting the South Coast region to Boston will deteriorate even further, resulting in a concurrent increase in congestion, accidents, travel time, and air pollution; not only on the highways themselves but potentially also on nearby local roadways that may absorb the traffic spillover from nearby congested highways.

Access from the South Coast region to Boston is primarily via Route 24 to Interstate 93. These principal, limited-access highways currently operate at or over capacity, with peak-hour volumes of up to 4,000 vehicles per hour and level-of-service F on Route 24 in Raynham, and 3,500 vehicles per hour and level-of-service F on I-93/Route 128 in Braintree. Notwithstanding the beneficial effects on reducing congestion of several transportation improvements such as high-occupancy vehicle lanes on I-93, improved MBTA Red Line service, and Old Colony Commuter Rail service, these measures have not been able to fully accommodate the growth in transportation demand between Boston and the South Coast region. Route 24 continues to operate at poor levels-of-service, resulting in substantial congestion and decreased safety. For travel between Boston and the South Coast region there are no other direct highway routes besides Route 24 and I-93. Measures to fundamentally reduce congestion on these highways have proven to be limited in their effectiveness. Roadway improvement measures are being proposed (as described in Chapter 2); however while these measures will improve intraregional traffic conditions they will not address the need for increased transportation capacity between the South Coast region and Boston.

Regional Transportation Conditions

The freeway/highway analysis portion of the study reviews highway capacity at critical locations along the I-93, Route 24, and Route 140 limited access freeways and Route 138. Highway capacity directly affects bus operations along each bus route to Boston. The highway corridors in Southeastern Massachusetts experience more congestion in the morning peak period as traffic increases in a northbound direction towards the urban core of Metropolitan Boston. Traffic volumes are substantially less as traffic travels southbound away from the Metropolitan Boston urban core with traffic peaking again to a lesser degree near the urban centers of New Bedford, Fall River, and Taunton.

Freeways/Highways

Thirteen freeway and highway locations were identified as important roadway segments that influence bus travel times to downtown Boston. These locations are segments located between major highway interchanges with substantial traffic merging and diverging at each highway interchange. The analyses include seven locations on Route 24, and two each on Route 140, Route 138, and I-93. The freeway/highway capacity analysis for these segments gives an understanding of the existing directional traffic operations on each segment for each weekday peak hour. However, it should be understood that highway operations are also impacted by merging/diverging traffic at interchanges.

Table 4.1-9 shows LOS for 13 freeway segments. All Route 24 locations, north of Route 44, operate at LOS D or E conditions in the peak direction in each peak hour. Route 24 south of Pond Street and Route 24 south of I-93 both have LOS E conditions during the weekday evening peak hour in a southbound direction. This coincides with the outbound evening commuter peak from Boston. I-93 south of Furnace Brook Parkway also has LOS E conditions during the weekday morning peak hour in a northbound direction. I-93 South of Route 3 does not exhibit worse than LOS D conditions because of lower volumes than on I-93 south of Furnace Brook Parkway. Although observed traffic conditions often times indicate heavy congestion (LOS E /F) on these segments, this is often associated with merging/diverging traffic between travel lanes and the HOV lane, construction activities, crashes, and other factors that are not considered in the freeway analysis methodology. The analysis results are only for the segments and do not reflect interchange circulation and event dynamics with resultant delay and queuing.

Table 4.1-10 shows the analysis results for Route 138 highway segments. The HCM analysis procedures for highways (which are not limited access or divided) differ from the freeway analysis procedures and are reported separately. The results indicate LOS D operations on these roadway segments in both peak hours.

Table 4.1-9 Freeway Capacity Analyses Summary

Location/Movement	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Volume[1]	Density[2]	LOS[3]	Volume	Density	LOS
I-93, south of Furnace Brook Parkway						
Northbound Travel Lane	7845	38.7	E	5310	24.5	C
Southbound Travel Lane	5085	23.5	C	7255	33.4	D
I-93, south of Route 3						
Northbound Travel Lane	5955	24.8	C	4755	19.3	C
Southbound Travel Lane	6985	29.4	D	7375	31.7	D
Route 24, south of I-93/128						
Northbound Travel Lane	5100	34.3	D	2775	15.6	B
Southbound Travel Lane	3400	19.2	C	6110	36.2	E
Route 24, south of Pond Street						
Northbound Travel Lane	5355	29.6	D	3330	17.8	B
Southbound Travel Lane	3075	16.5	B	6010	35.0	E
Route 24, north of Route 123						
Northbound Travel Lane	5405	30.6	D	3260	17.5	B
Southbound Travel Lane	2350	12.4	B	5445	28.5	D
Route 24, north of I-495						
Northbound Travel Lane	5260	29.3	D	3435	18.6	C
Southbound Travel Lane	2630	15.1	B	4755	26.5	D
Route 24, north of Route 44						
Northbound Travel Lane	3930	34.4	D	2475	19.7	C
Southbound Travel Lane	2110	16.6	B	3860	33.2	D
Route 24, north of Route 140						
Northbound Travel Lane	3795	19.3	C	2060	10.9	A
Southbound Travel Lane	1860	9.7	A	3910	20.0	C
Route 24, south of Route 140						
Northbound Travel Lane	1110	8.7	A	1255	10.2	A
Southbound Travel Lane	1355	11.0	A	2875	22.4	C
Route 24, north of Exit 9						
Northbound Travel Lane	1835	10.1	A	1610	13.9	B
Southbound Travel Lane	1430	13.1	B	2390	21.6	C
Route 24, south of Exit 8 ½						
Northbound Travel Lane	2030	16.4	B	1890	15.8	B
Southbound Travel Lane	1770	15.9	B	2590	22.9	C
Route 140, south of Route 24						
Eastbound Travel Lane	830	7.2	A	1740	14.2	B
Westbound Travel Lane	1595	13.2	B	1060	8.9	A
Route 140, north of Hathaway Road						
Northbound Travel Lane	2015	16.3	B	2085	16.7	B
Southbound Travel Lane	2160	19.3	C	2225	19.3	C

1 Volume in vehicles per hour.
2 Expressed as passenger cars per lane per mile
3 Freeway level of service

Table 4.1-10 Highway Capacity Analyses Summary

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location/Movement	volume[1]	v/c[2]	LOS[3]	volume	v/c	LOS
Easton						
Route 138, south of Route 106						
North/Southbound Travel Lane	1405	0.47	D	1565	0.54	D
Taunton						
Route 138, south of Bay Street						
North/Southbound Travel Lane	1350	0.44	D	1575	0.51	D

1 Volume expressed in vehicles per hour
2 Volume to capacity ratio
3 Level of service for Class II roadway as defined by HCM CH. 12 pp. 12-12, 12-13

Intersections

Intersection LOS was completed at park-and-ride locations observed with potential operational or safety issues. The two park-and-ride lots that were analyzed include West Center Street (Route 106) at Pleasant Street in West Bridgewater and Mt. Pleasant Street a park-and-ride lot in New Bedford.

In order to compare operations during off peak and peak seasonal traffic conditions, turning movement counts were completed during the summer and fall 2008. The West Bridgewater Route 106 park-and-ride lot is located directly south of Route 106 off of Pleasant Street. The lot is inaccessible by bus, so the Taunton bus parks outside the lot at the corner of Pleasant Street/internal connector roads to pick-up and drop-off passengers. The New Bedford Mt. Pleasant Street park-and-ride lot is located north of the Route 140 southbound ramps, on the east side of the street approximately 500 feet north of the ramp system.

The Route 106 park-and-ride lot is accessed via Pleasant Street or connector roads south of Route 106. Route 106 at this location is an arterial road with minimal gaps in traffic available at peak hour during the signal change at Route 106/Manley Street. Existing traffic operations indicate high delay for the minor street approach during the fall 2008 peak condition. During this period LOS for the Pleasant Street intersection minor approach is LOS F.

The Mount Pleasant Street park-and-ride lot is accessed directly from Mount Pleasant Street as a "T" type intersection. Mount Pleasant Street is a collector type road with average gaps at peak hour. Traffic operations indicate average to better than average delay for exiting traffic from the park-and-ride lot. During both summer and fall periods, traffic operations are acceptable at LOS C or better for all movements.

The HCM methodologies used for the analyses of unsignalized intersections are based on conservative analysis variables including periods of high critical gaps in traffic. However, actual traffic operations indicate that drivers on minor streets and driveways accept smaller gaps in traffic than the default values used in the analysis procedures and therefore experience less delay than reported by the HCM.

Also, the HCM methodologies do not fully take into account the beneficial grouping or platoon effects caused by the nearby signalized intersections. The results of HCM analysis procedures are the over-estimation of calculated delays at unsignalized intersections in the study area. A detailed review of the results should be completed when interpreting the capacity analysis results at unsignalized

intersections. A summary of the unsignalized capacity analyses during both the summer and fall 2008 is presented in Tables 4.1-11 and 4.1-12, respectively.

Table 4.1-11 Existing Conditions–Park-and-Ride Lots Intersection Level of Service Analysis (Summer 2008)

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location/Movement	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c**	**Delay**	**LOS**
West Center St. (Route 106) at Pleasant St.						
West Center St. WB – LT[4]	0.07	2.2	A	0.16	1.8	A
Pleasant St. NB – LR[5]	0.21	23.4	C	0.53	44.6	E
Mt. Pleasant St. at Park-and-Ride						
Mt. Pleasant St. SB – LT[6]	0.00	0.0	A	0.00	0.1	A
Park-and-Ride WB – LR[7]	0.01	12.9	B	0.17	16.5	C

1 Volume expressed in vehicles per hour
2 Volume to capacity ratio
3 Level of service for Class II roadway as defined by HCM CH. 12 pp. 12-12, 12-13
4 Indicates westbound left-through lane movement
5 Indicates northbound left-right lane movement
6 Indicates southbound left-through lane movement
7 Indicated westbound left-right lane movement

Table 4.1-12 Existing Conditions–Park-and-Ride Lots Intersection Level of Service Analysis (Fall 2008)

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location/Movement	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c**	**Delay**	**LOS**
West Center St. (Route 106) at Pleasant St.						
West Center St. WB – LT[4]	0.09	2.6	A	0.12	3.7	A
Pleasant St. NB – LR[5]	0.51	52.4	F	0.63	53.9	F
Mt. Pleasant St. at Park-and-Ride						
Mt. Pleasant St. SB – LT[6]	0.00	0.0	A	0.00	0.1	A
Park-and-Ride WB – LR[7]	0.01	12.3	B	0.20	17.5	C

1 Volume expressed in vehicles per hour
2 Volume to capacity ratio
3 Level of service for Class II roadway as defined by HCM CH. 12 pp. 12-12, 12-13
4 Indicates westbound left-through lane movement
5 Indicates northbound left-right lane movement
6 Indicates southbound left-through lane movement
7 Indicated westbound left-right lane movement

As indicated in Tables 4.1-11 and 4.1-12, the West Center Street (Route 106) at Pleasant Street intersection northbound approach is operating with substantial delay during the evening peak hour. This delay was evident in both the summer and fall 2008 analysis periods with delays being longer during the fall likely because of higher traffic volumes related to school and vacation schedules. The morning peak hour also operates at a deficient LOS F in the fall. Based on the traffic characteristics of this location, higher delay should be expected with the high volume on Route 106 and the multiple conflicts represented along Route 106 including traffic from the Route 24 southbound off ramp which deposits Route 106 westbound traffic immediately east of this intersection.

4.1.3.3 Safety Analysis

The three years of crash data (2004-2006) for the regional highways were obtained and reviewed. Summary tables for the safety analysis are provided in Appendix 4.1-B.

Freeway/Highway Safety

In order to identify crash trends, historical crash data were obtained from MassDOT Highway Division for the most recent three-year period available for the regional highways in the study area: I-93, Route 24, and Route 140. For each highway, vehicle crashes were compiled by specific community. Data analyzed for each crash include year of incident, crash type, severity, weather, and time of day.

A brief summary of the highway crash data by roadway is provided below for I-93, Route 24 and Route 140.

I- 93

- As might be expected of the section of I-93 with the highest traffic levels between Randolph through Boston, the Quincy section experienced 755 crashes (28 percent) during the three-year period.
- Fifty-seven percent of all the crashes were rear-end type collisions, typical of heavily congested corridors.
- Approximately 31 percent of the crashes involved fatalities or injuries, 59 percent involved property-damage only and 10 percent of the crashes were unknown.
- Seventy-two percent of the crashes occurred during dry conditions.

Route 24

- The Fall River section of Route 24 has experienced the most crashes (432 crashes or 15 percent) during the latest three year period. Approximately 36 percent of the crashes involved fatalities or injuries, 58 percent involved property-damage only, and 2 percent of the crashes were unknown.
- Sixty-nine percent of the crashes occurred during dry roadway conditions.
- Single vehicle and rear-end type collisions each represented 37 percent of total crashes.

Route 140

The limited access portion of Route 140 between Route 24 in Taunton and New Bedford experienced a total of 758 crashes in the most three year period for which data were available.

- Approximately 36 percent of the crashes involved fatalities or injuries, 59 percent involved property damage only.
- Seventy percent of the crashes occurred during dry pavement conditions.

Park-and-Ride Locations Intersection Safety

The following summarize the crash numbers and characteristics at the two proposed park-and-ride locations analyzed.

Route 106/Route 24 Park-and-Ride in West Bridgewater

The proposed park-and-ride facility would be located north of Route 106 (West Center Street) opposite Pleasant Street in the northwest quadrant of the Route 106/Route 24 interchange. Some of the issues prompting more detailed analysis of the Route 106 site include:

- The average daily traffic volume on Route 106 at this location is 23,500 vehicles per day based on the MassDOT Highway Division 2006 traffic volume database.
- The Pleasant Street/West Center Street (Route 106) intersection is unsignalized with STOP sign control on Pleasant Street.
- Traffic speeds on Route 106.
- The gaps in peak hour traffic are limited with high volumes in both directions.
- Observed minor street delay was substantial during peak hours.

Mount Pleasant Street Park-and-Ride Lot in New Bedford

The site of the proposed facility is in the northwest quadrant of the Route 140 and King's Highway interchange (Exit 4). Some of the issues prompting a more detailed analysis of the Mount Pleasant Street site include:

- The Mount Pleasant Street park-and-ride site driveway is located close to a horizontal curve that limits sight distance to the north.
- Based on recent utilization surveys completed in the summer and fall of 2008, this 201-space lot is heavily utilized at 80 percent of capacity.
- During peak hour this intersection experiences substantial turning and vehicle conflicts to enter and exit the parking lot.
- The average daily traffic volume on Mt. Pleasant Street at this location is 13,500 vehicles per day based on the MassDOT Highway Division 2004 traffic volume database.

In order to check the safety record of each location, crash records were obtained from MassDOT Highway Division. Each location has a crash rate that is substantially less than the MassDOT Highway Division District 5 average crash rate of 0.59 crashes per million entering vehicles for unsignalized intersections.

Traffic operations at these two park–and-ride facilities are discussed further in the intersection analysis section.

Summary of Existing Safety Conditions

The number of accidents on the primary travel routes within the South Coast region has generally been increasing over the past years. Projected future growth in traffic volume on the principal South Coast region roadways cannot be sustained by the current regional transportation system. Recurring traffic congestion is becoming a more significant problem for the region, as is the increasing frequency of traffic accidents, especially along congested roadway corridors. Traffic volume increases may thus contribute to increased risk of injury and property damage for the commuting public. Not only has the number of accidents increased, but also the number of injuries has increased on two area highways. The annual growth rate in injuries was 11.6 percent on Route 24 and 8.0 percent on Route 93. However, Route 140 experienced an annual decline rate in injuries, at -5.9 percent. Although increasing the capacity of the region's highways might improve safety temporarily, substantial highway capacity expansions are constrained by transportation policy and due to the constraints posed by available space within existing rights-of-way, the potential for physical expansion of the highway links is limited.

4.1.3.4 Grade Crossings

Conditions at existing grade crossings were identified, as the rail alternatives using these grade crossings would increase train frequency at these grade crossings and could thus affect traffic flows and roadway capacity on either side of each grade crossing. This section presents information regarding the existing grade crossings at each of the alternatives' alignment, including existing traffic volumes and the existing frequency of both commuter and freight train service at the existing grade crossings.

Southern Triangle Study Area (Common to All Build Alternatives)

There are 50 public and private existing grade crossings within the Southern Triangle. Existing train frequency at these crossings ranges from two to five roundtrip freight trains per week (four to ten trains in total). Specific data for each crossing are provided in Tables 4.1-13 and 4.1-14 for the New Bedford Main Line and the Fall River Secondary, respectively.

Whittenton Alternative—Attleboro Secondary Line

There are 10 public and private grade crossings within the Attleboro Secondary Line segment of the Whittenton Alternative alignment. Existing train frequency at these crossings ranges from two to five roundtrip freight trains per week (four to ten trains in total). Specific data for each crossing are provided in Table 4.1-15.

Stoughton/Whittenton Alternatives—Stoughton Line from Canton Junction to Weir Junction, including Whittenton Branch

There are 41 existing public and private grade crossings along these portions of the Stoughton and Whittenton alignments. Train frequency from Canton Junction station to Stoughton station, along the existing MBTA Stoughton Commuter Rail Line alignment, ranges from 16 roundtrip (32 total trains) passenger trains per day on weekdays to no passenger trains on weekends. There is also freight service several times a week between Canton Junction station and Central Street in Stoughton. There is no existing train frequency along the unused rail alignment from Stoughton station to Longmeadow Road in Taunton. Between Weir Junction and Longmeadow Road, train frequency is approximately two roundtrip freight trains (four total trips) per month. Train frequency near Ingell Street at Weir Junction varies weekly, approximately 10 roundtrip freight trains operated by CSX and three roundtrips operated by Mass Coastal weekly). The Whittenton Alternative has six public and private grade crossings along the currently inactive Whittenton branch. Specific data for each crossing are provided in Table 4.1-16.

Table 4.1-13 Existing Conditions–Southern Triangle (New Bedford Main Line) At-Grade Crossing Summary

Name	Town	Approx. Milepost[1]	Type	Existing Track Use[2]	Posted Speed (MPH)	Traffic Volumes (AADT)	AADT Year
Ingell Street	Taunton	35.46	PUBLIC	FRT-5days/wk2	40	6,500	2000
Hart Street	Taunton	35.98	PUBLIC	FRT-5days/wk2	30	11,050	2000
Silva Crossing	Taunton	36.48	PRIVATE	FRT-5days/wk2	0	-----	-----
W. Stevens Street	Taunton	37.81	PRIVATE	FRT-5days/wk	10	200	-----
Cotley Street	Berkley	38.34	PUBLIC	FRT-5days/wk	10	240	-----
Padelford Street	Berkley	39.85	PUBLIC	FRT-5days/wk	40	1,900	2000
Myricks Street	Berkley	40.52	PUBLIC	FRT-5days/wk	40	3,840	-----
Malbone Street	Lakeville	40.96	PUBLIC	FRT-3days/wk	30	1,300	2001
Obed Crossing	Lakeville	41.34	PRIVATE	FRT-3days/wk	0	-----	-----
Plank Crossing	Lakeville	42.69	PRIVATE	FRT-3days/wk	0	-----	-----
Gravel Bank	Lakeville	42.99	PRIVATE	FRT-3days/wk	0	-----	-----
Stonewall Crossing	Lakeville	43.56	PRIVATE	FRT-3days/wk	0	-----	-----
Jeep Crossing	Lakeville	43.98	PRIVATE	FRT-3days/wk	0	-----	-----
Jeep Crossing	Lakeville	44.17	PRIVATE	FRT-3days/wk	0	-----	-----
Townline Crossing	Freetown	44.36	PRIVATE	FRT-3days/wk	0	-----	-----
Pierce Gravel Pit	Freetown	45.09	PRIVATE	FRT-3days/wk	0	-----	-----
Gas Line	Freetown	45.51	PRIVATE	FRT-3days/wk	0	-----	-----
Chace Road	Freetown	45.62	PUBLIC	FRT-3days/wk	40	3,100	2003
Private Road	Freetown	46.06	PRIVATE	FRT-3days/wk	0	-----	-----
Lucas Crossing	Freetown	46.37	PRIVATE	FRT-3days/wk	0	-----	-----
Lawrence Crossing	Freetown	46.66	PRIVATE	FRT-3days/wk	0	-----	-----
Braley Road	Freetown	47.24	PUBLIC	FRT-3days/wk	40	1,800	2000
Occupation Crossing	Freetown	47.35	PRIVATE	FRT-3days/wk	0	-----	-----
Pittsley Crossing	Freetown	47.44	PRIVATE	FRT-3days/wk	0	-----	-----
East Chipaway Rd.	Freetown	47.84	PUBLIC	FRT-3days/wk	40	2,500	2000
Private Road	Freetown	48.21	PRIVATE	FRT-3days/wk	0	-----	-----
Samuel Barnet Rd.	New Bedford	49.03	PUBLIC	FRT-3days/wk	30	5,100	2001
Polaroid Crossing	New Bedford	49.10	PRIVATE	FRT-3days/wk	0	-----	-----
Pig Farm Road	New Bedford	51.17	PUBLIC	FRT-3days/wk	10	-----	-----
Tarkiln Hill Road	New Bedford	51.93	PUBLIC	FRT-3days/wk	30	29,050	2001
Nash Road	New Bedford	52.91	PUBLIC	FRT-3days/wk	30	12,700	2000

1 Mileposts for NB Mainline Measure from Canton Junction to New Bedford Station
2 Existing Track Use Referenced From, NBFR Document ID: 46, Track Condition Assessment Report, 09/1995, (Pg 11-12)
FRT Freight service

Table 4.1-14 Existing Conditions – Southern Triangle (Fall River Secondary) At-Grade Crossing Summary

Name	Town	Approx. Milepost[1]	Type	Existing Track Use[2]	Posted Speed (MPH)	Traffic Volumes (AADT)	AADT Year
Mill Street	Berkley	40.73	PUBLIC	FRT-2days/wk	-----	-----	-----
Adams Lane	Berkley	41.19	PRIVATE	FRT-2days/wk	0	-----	-----
Private Road	Lakeville	41.31	PRIVATE	FRT-2days/wk	-----	-----	-----
Private Road	Freetown	41.41	PRIVATE	FRT-2days/wk	-----	-----	-----
Beechwood Street	Assonet	41.83	PUBLIC	FRT-2days/wk	0	300	2002
Richmond Road – North	Freetown	41.88	PUBLIC	FRT-2days/wk	40	3,000	2001
Private Road	Freetown	42.53	PRIVATE	FRT-2days/wk		-----	-----
Private Road	Freetown	42.84	PRIVATE	FRT-2days/wk	-----	-----	-----
Forge Road -North	Freetown	42.93	PUBLIC	FRT-2days/wk	10	900	2001
Richmond Road – South	Freetown	42.98	PUBLIC	FRT-2days/wk	40	3,600	2001
Forge Road - South	Freetown	43.25	PUBLIC	FRT-2days/wk	30	2,700	2001
Elm Street	Freetown	43.57	PUBLIC	FRT-2days/wk	40	4,200	2001
High Street	Freetown	44.31	PUBLIC	FRT-2days/wk	30	920	2001
Private Road	Freetown	44.97	PRIVATE	FRT-2days/wk	-----	-----	-----
Copicut Road	Freetown	45.31	PUBLIC	FRT-2days/wk	30	450	2001
Brightman Lumber	Freetown	46.10	PRIVATE	FRT-2days/wk	-----	-----	-----
Golf Club Road	Fall River	48.17	PRIVATE	FRT-2days/wk	-----	-----	-----
Near Canedy Street-Culvert	Fall River	48.51	PRIVATE	FRT-2days/wk	-----	-----	-----
Private Road	Fall River	49.60	PRIVATE	FRT-2days/wk	-----	-----	-----

1 Mileposts for NB Mainline Measure from Canton Junction to New Bedford Station
2 Existing Track Use Referenced From, NBFR Document ID: 46, Track Condition Assessment Report, 09/1995, (Pg 11-12)
FRT Freight service

Table 4.1-15 Existing Conditions–Whittenton Alternative Study Area (Attleboro Secondary Portion) At-Grade Crossing Summary

Street Name	Town	Approx. Milepost[1]	Type	Existing Track Use[2]	Posted Speed (MPH)	Traffic Volume (AADT)	AADT Year
West Britannia	Taunton	33.00	PUBLIC	FRT	30	4,600	2000
Danforth Street	Taunton	33.64	PUBLIC	FRT	-----	3,800	2000
Tremont Street	Taunton	34.06	PUBLIC	FRT	-----	15,500	2000
Oak Street	Taunton	34.23	PUBLIC	FRT	-----	11,500	2000
Porter Street	Taunton	34.47	PUBLIC	FRT	-----	3,000	2000
Cohannet Street	Taunton	34.54	PUBLIC	FRT	-----	1,900	2000
Winthrop Street	Taunton	34.60	PUBLIC	FRT	35	16,300	2000
Harrison Avenue	Taunton	34.74	PUBLIC	FRT	-----	1,900	2000
Somerset Avenue	Taunton	34.92	PUBLIC	FRT	-----	8,100	2000
Weir Street	Taunton	35.00	PUBLIC	FRT	-----	13,000	2001

1 Mileposts for NB Mainline Measure From Canton Junction to New Bedford Station
2 Existing Track Use Referenced From, NBFR Document ID: 46, Track Condition Assessment Report, 09/1995, (Pg 11-12)
FRT Freight service

Table 4.1-16 Existing Conditions–Stoughton/Whittenton Alternatives Study Area At-Grade Crossing Summary

Name	Town	Approx Milepost[1]	Type	Existing Track Use[2]	Posted Speed (MPH)	Traffic Volume (AADT)	AADT Year
Washington Street	Canton	15.57	PUBLIC	CR	20	18,900	2002
Pine Street	Canton	16.64	PUBLIC	CR	25	4,000	2000
Will Drive	Canton	17.05	PUBLIC	CR	-----	2,000	2002
Central Street	Stoughton	17.86	PUBLIC	CR	-----	15,400	2000
Simpson Street	Stoughton	18.16	PUBLIC	CR	-----	2,000	2000
School Street	Stoughton	18.65	PUBLIC	CR	-----	6,500	2004
Porter Street (RTE 27)	Stoughton	18.80	PUBLIC	CR	40	10,800	2000
Wyman Street	Stoughton	18.88	PUBLIC	CR	-----	3,500	2000
Brock Street	Stoughton	19.14	PUBLIC	CR	-----	3,050	2,001
Plain Street	Stoughton	19.54	PUBLIC	NA	-----	6,700	1998
Morton Street	Stoughton	20.15	PUBLIC	NA	45	-----	-----
Pearson's Crossing	Stoughton	20.26	PRIVATE	NA	45	-----	-----
Stanley Prod. Co.	Stoughton	20.32	PRIVATE	NA		-----	-----
Fish and Game Club	Stoughton	20.41	PRIVATE	NA	45	-----	-----
Elm Street	Easton	22.55	PUBLIC	NA	-----	4,250	2006
Oliver Street	Easton	22.68	PUBLIC	NA	-----	-----	-----
Williams Street	Easton	23.19	PUBLIC	NA	-----	-----	-----
Easton DPW	Easton	23.56	PUBLIC	NA	-----	-----	-----
Gary Lane	Easton	24.08	PUBLIC	NA	-----	-----	-----
Short Street	Easton	24.48	PUBLIC	NA	-----	4,000	2001
Depot Street - Route 123	Easton	24.90	PUBLIC	NA	-----	16,900	2006
Purchase Street	Easton	25.10	PUBLIC	NA	-----	2,100	2004
Prospect Street	Easton	25.82	PUBLIC	NA	-----	1,850	2003

Name	Town	Approx Milepost[1]	Type	Existing Track Use[2]	Posted Speed (MPH)	Traffic Volume (AADT)	AADT Year
Country Club	Easton	26.32	PRIVATE	NA	-----	-----	-----
Foundry Street - Route 106	Easton	26.71	PUBLIC	NA	-----	10,900	2004
Power Line	Easton	27.34	PUBLIC	NA	-----	-----	-----
Race Track Crossing	Raynham	29.00	PRIVATE	NA	-----	-----	-----
Elm Street	Raynham	30.35	PUBLIC	NA	-----	-----	-----
Carver Street	Raynham	30.79	PUBLIC	NA	-----	-----	-----
Route 138	Raynham	31.31	PUBLIC	NA	-----	-----	-----
Britton Street	Raynham	31.44	PUBLIC	NA	-----	-----	-----
King Phillip Street	Raynham	32.02	PUBLIC	NA	-----	-----	-----
East Britannia Street	Raynham	33.04	PUBLIC	NA	-----	-----	-----
Longmeadow Road	Taunton	33.82	PUBLIC	NA	40	11,550	2006
Dean Street - Route 44	Taunton	34.36	PUBLIC	FRT	40	28,750	2002
Whittenton Branch (inactive)							
Private Road	Raynham	29.99	PRIVATE	NA	-----	-----	-----
Private Road	Raynham	30.47	PRIVATE	NA	-----	-----	-----
Private Road	Raynham	30.84	PRIVATE	NA	-----	-----	-----
Private Road	Taunton	31.25	PRIVATE	NA	-----	-----	-----
Whittenton Street	Taunton	32.01	PUBLIC	NA	-----	-----	-----
Warren Street	Taunton	32.28	PUBLIC	NA	-----	-----	-----

1 Mileposts for NB Mainline Measure From Canton Junction to New Bedford Station
2 Existing Track Use Referenced From, NBFR Document ID: 46, Track Condition Assessment Report, 09/1995, (Pg 11-12)
NA Not Active
FRT Freight service
CR Commuter Rail

4.1.3.5 Station Area Traffic Conditions

There are 12 potential new or relocated commuter rail stations proposed for the Stoughton and/or Whittenton Alternatives. These stations are located in the following communities:

- New Bedford—King's Highway and Whale's Tooth
- Freetown—Freetown
- Fall River—Fall River Depot and Battleship Cove
- Taunton—Taunton, Dana St. and Taunton Depot
- Stoughton—Stoughton (relocated)
- Easton—Easton Village and North Easton
- Raynham—Raynham Park

Traffic impact study areas were based on the proposed station locations. This section provides roadway and intersection inventories, traffic volume data, safety data, and traffic operations for each station study area.

Southern Triangle

New Bedford Stations Study Area (King's Highway Station and Whale's Tooth Station)

The traffic impact study areas within the City of New Bedford were selected for the two proposed commuter rail station locations. Figure 4.1-5 shows the location of the New Bedford stations and selected study area intersections.

New Bedford has two station locations proposed for all rail alternatives. The following paragraphs summarize the locations and features of the King's Highway stations and Whale's Tooth station.

The King's Highway station, located in northern New Bedford along King's Highway east of Route 140, would serve all of the rail alternatives. The station would serve walk-in, bike-in, and drive-in customers.

The Whale's Tooth station, located at the Whale's Tooth parking lot would serve all of the rail alternatives. Located on the New Bedford waterfront, the City of New Bedford has constructed a parking lot on the site in anticipation of the commuter rail project. The station would include intermodal connections, potentially including ferry services. The site would serve walk-in, bike-in, and drive-in customers with primary access from Herman Melville Boulevard.

Existing Traffic Volumes

Traffic volume data for the Whale's Tooth station and King's Highway station were collected in September 2008 and included ATR counts and manual TMCs. TMCs were collected in June and July 2009 for three intersections in the King's Highway station study area and one intersection in the Whale's Tooth station study area.

Table 4.1-17 presents a summary of the daily and peak hour roadway volumes. King's Highway carries the highest volume in the vicinity of the King's Highway station with approximately 19,500 vehicles per day (vpd) on a typical weekday, approximately 1,300 vehicles during the weekday morning peak hour and 1,500 vehicles during the weekday evening peak hour. Coggeshall Street carries the highest volume in the vicinity of the Whale's Tooth station with approximately 11,500 vpd on a typical weekday, approximately 750 vehicles during the weekday morning peak hour and 850 vehicles during the weekday evening peak hour.

The TMCs were collected during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak periods at each of the study area intersections. These volumes were reviewed, balanced and rounded to the nearest five to develop the traffic volume networks used to evaluate existing traffic operations. The morning network peak hour occurred from 7:45 to 8:45 AM and the evening network peak hour occurred from 4:00 to 5:00 PM. Peak hour traffic flow networks for an existing weekday morning and evening peak hour for Whale's Tooth and King's Highway stations are shown in Figures 4.1-6 through 4.1-9.

Table 4.1-17 Existing Traffic Volumes–New Bedford

		Weekday Morning Peak Hour			Weekday Evening Hour		
Location	**Daily Weekly Traffic[1]**	**Volume (vph)[2]**	**"K" Factor[3]**	**Peak Directional Flow[4]**	**Volume (vph)**	**"K" Factor**	**Peak Directional Flow**
King's Highway, east of Route 140 NB Ramps	19,300	1,295	6.7%	WB 50%	1,455	7.6%	SB 53%
Church St., south of Park St.	11,500	790	6.9%	NB 53%	1,040	9.0%	SB 53%
Hillman St., west of Acushnet St/Route 18	4,900	360	7.3%	EB 60%	410	8.2%	NB 56%
McArthur Dr., north of Union St.	6,800	495	7.3%	NB 49%	600	8.8%	WB 55%
Union St., west of JFK Highway	8,500	630	7.4%	EB 59%	600	7.1%	EB 70%
Kempton St., east of Pleasant St.	6,630	920	13.8%	WB 74%	1,205	18.2%	WB 64%
Coggeshall St., west of North Front St.	11,500	750	6.5%	EB 61%	855	7.5%	EB 63%
Purchase St., south of Logan St.	10,100	630	6.2%	NB 53%	795	7.9%	NB 53%
Logan St., west of North Front St.	2,800	245	8.6%	EB 70%	220	2.1%	EB 62%
Acushnet Ave./Route 18, north of Hillman St.	2,000	145	7.4%	NB 59%	165	1.6%	SB 53%

Based on ATR counts conducted in September 2008.
1 average daily traffic (ADT) volume expressed in vehicles per day
2 peak period traffic volumes expressed in vehicles per hour
3 percent of daily traffic that occurs during the peak period
4 directional distribution of peak period traffic
Note: peak hours do not necessarily coincide with the peak hours of the individual intersection turning movement counts

Crash Analysis Summary—The New Bedford study area is made up of two separate subareas, the Whale's Tooth station and the King's Highway station. A total of 175 crashes occurred within the Whale's Tooth station study area, and 117 crashes occurred within the King's Highway station study area. There were seven intersections in the Whale's Tooth station study area and two intersections in the King's Highway station study area which exceeded the District 5 crash rates for signalized and unsignalized intersections.

The number of crashes and crash rates for the seven intersections that exceeded the District 5 crash rate in the Whale's Tooth station study area are:

- Four crashes occurred at the Acushnet Street at Hillman Street (0.65 vs. 0.59).
- Fourteen crashes occurred at the intersection of Purchase Street at Coggeshall Street (1.01 vs. 0.59).

- Sixteen crashes occurred at the intersection of Coggeshall Street at Acushnet Avenue/Route 18 Northbound (0.86 vs. 0.84).
- Fifty-one crashes occurred at the intersection of Coggeshall Street at Ashley Boulevard/Route 18 Southbound (2.92 vs. 0.84).
- Nine crashes occurred at the intersection of Logan Street at North Front Street (1.18 vs. 0.59).
- Fourteen crashes occurred at the intersection of Logan Street at Purchase Street (1.18 vs. 0.59).
- Six crashes occurred at the intersection of Wamsutta Street at Acushnet Avenue/Route 18 Northbound (3.30 vs. 0.59).
- Fifty percent of the crashes were angle type.
- Sixty-nine percent of the crashes occurred on dry pavement.

Two intersections (Church Street at Park Avenue (1.69 vs. 0.59) and King's Highway at Jones Street (0.64 vs. 0.59) exceed the District 5 crash rate in the King's Highway station study area.

- These intersections account for 38 percent of the incidents that occur in the King's Highway station study area.
- Sixty-one percent of the crashes at these two locations were angle type incidents. This may be a result of the high eastbound right turning volume.
- Forty-three percent of the crashes involved personal injuries and 48 percent involved property damage only.
- Sixty-eight percent of the crashes occurred during daylight hours on a dry road surface.

Traffic Operations Analysis—An analysis of the existing conditions near the Whale's Tooth and King's Highway stations was performed to assess the ability of intersections to process traffic. The results of the analyses for these intersections for 2008 Existing Conditions are presented in Table 4.1-18.

The Whale's Tooth station study area consists of seven signalized and eleven unsignalized intersections. Under existing conditions, two signalized intersections operate at deficient levels of service. The Union Street at Route 18 Southbound intersection operates at LOS F in the evening peak hour and LOS E in the morning peak hour due to heavy southbound through movements on Route 18 that are unable to adequately pass through the intersection in the allocated green time. The six approaches and moderate traffic volumes are the primary reasons that the Kempton Street at Purchase Street intersection operates at LOS F and E in the morning and evening peak hours, respectively. Three of the unsignalized intersections operate at a LOS E in the evening peak hour and one intersection operates at LOS E and F in the morning and evening peak hours, respectively. These unsignalized intersections experience long delays in the evening peak hour for left-turning movements from the minor street to the major street. The delays are primarily due to the high through traffic volumes on the major street.

Table 4.1-18 New Bedford Intersection Capacity Analysis–2008 Existing Conditions

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Signalized Intersections	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
Whale's Tooth Station						
Hillman St at Purchase St.	0.35	12	B	0.49	14	B
Kempton St at Purchase St	0.76	>80	F	0.86	69	E
Union St. at Route 18	0.82	58	E	>1.00	>80	F
State Pier at McArthur Dr.	0.42	28	C	0.42	39	D
Route. 18 NB at Coggeshall St.	0.48	17	B	0.53	18	B
Route. 18 SB at Coggeshall St.	0.80	32	C	0.67	23	C
Coggeshall St. at Belleville Ave.	0.66	19	B	0.67	19	B
King's Highway Station						
King's Hwy. at Route. 140 NB Ramps	0.63	13	B	0.86	23	C
Route. 18 at Wood St	0.55	21	C	0.66	16	B
Church St. at Nash Rd	0.55	17	B	0.87	27	C
Church St. at Tarkiln Hill Rd	0.69	17	B	0.81	29	C
King's Hwy. at Stop & Shop driveway	0.46	8	A	0.66	12	B
King's Hwy. at Shaw's driveway	0.47	6	A	0.59	8	A
Unsignalized Intersections	Critical	Delay[1]	LOS[2]	Critical	Delay	LOS
Whale's Tooth Station						
Hillman St. at McArthur Dr.	EB L/R	11	B	EB L/R	12	B
McArthur Dr. at Herman Melville	WB L/R	14	B	WB L/R	17	C
Coggeshall St. at Purchase St.	SB All	17	C	NB All	39	E
Coggeshall St. at N. Front St.	NB All	50	E	NB All	>50	F
Purchase St. at Weld St.	WB L	23	C	WB L	43	E
Logan St. at Purchase St.	WB All	16	C	WB All	21	C
Logan St. at Acushnet Ave.	EB All	11	B	WB All	12	B
Logan St. at N. Front St.	EB All	21	C	EB All	20	C
Wamsutta St. at Herman Melville	EB All	11	B	EB All	12	B
Wamsutta St. at Acushnet Ave.	WB L/R	10	A	WB L/R	9	A
Purchase St. at Rt. 18 SB Exit Ramp	WB L/R	23	C	WB L/R	37	E
King's Highway Station						
Mt. Pleasant St. at Route. 140 SB	Rt. 140 WB	>50	F	Rt. 140 WB	>50	F
King's Hwy. at Mt. Pleasant St.	King's WB L	>50	F	King's WB L	>50	F
Church St. at Park Ave.	Park WB All	21	C	Park WB All	>50	F
Church St. at Irvington St.	Irvington WB	15	B	Irvington WB	20	C
King's Hwy. at Tarkiln Hill Rd.	Tarkiln EB L/R	25	D	Tarkiln EB L/R	>50	F

Source: Synchro 7.0 Software; Build 763
1 average control delay for critical movements, rounded to the nearest whole second, for unsignalized intersections.
2 level of service
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound
Shaded rows reflect the worst level of service intersections (LOS = F)

The King's Highway station study area consists of six signalized and five unsignalized intersections. All of the signalized intersections provide a good LOS in both the morning and evening peak hours. Two of the unsignalized intersections operate at LOS F in the morning and evening peak hours and two others operate at LOS F in the evening peak hour. These unsignalized intersections experience long delays for left-turning movements from the minor street to the major street. The delays are primarily due to the high through traffic volumes on the major street.

Freetown Station Study Area (Freetown Station)

The traffic impact study area within Freetown was selected based on the location of the proposed commuter rail station. Figure 4.1-10 shows the location of Freetown station and selected study area intersections.

The Freetown station, located on South Main Street south of the Route 24 and Route 79 interchange (Exit 9) would serve all of the rail alternatives. The station would serve drive-in customers and customers shuttled between the station and the nearby industrial parks, as well as pedestrians and bicyclists.

Existing Traffic Volumes—Traffic volume data for the Freetown station study area were collected in September 2008 and included ATRs and manual TMCs.

For the Freetown station study area, ATR data were collected on Route 79 between Route 24 northbound and southbound ramps (Exit 9) and on South Main Street, south of Route 24 Exit 9. Table 4.1-19 presents a summary of the daily and peak hour traffic volumes.

Table 4.1-19 Existing Traffic Volumes–Freetown

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location	**Daily Weekly Traffic[1]**	**Vol. (vph)[2]**	**"K" Factor[3]**	**Peak Directional Flow[4]**	**Vol. (vph)**	**"K" Factor**	**Peak Directional Flow**
S. Main St (Route 79), between Route 24 Ramps	10,100	825	8.1%	SB 70%	825	8.1%	SB 64%
S. Main St (Route 79), south of Route 24 Ramps	9,000	630	7.0%	SB 50%	705	7.8%	SB 50%

Based on ATR counts conducted in September 2008.
1 average daily traffic (ADT) volume expressed in vehicles per day
2 peak period traffic volumes expressed in vehicles per hour
3 percent of daily traffic that occurs during the peak period
4 directional distribution of peak period traffic
Note: peak hours do not necessarily coincide with the peak hours of the individual intersection turning movement counts

As presented in Table 4.1-19, Route 79 between the Route 24 Exit 9 ramps carries approximately 10,000 vehicles per day (vpd) on a typical weekday, with approximately 825 vehicles during the weekday morning peak hour and 825 vehicles during the weekday evening peak hour. South of the interchange, South Main Street carries approximately 9,000 vpd on a typical weekday, with approximately 650 vehicles during the weekday morning peak hour and 700 vehicles during the weekday evening peak hour.

The TMCs were collected during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak periods at each of the study area intersections. These volumes were reviewed, balanced and rounded to the nearest five to develop the traffic volume networks used to evaluate existing traffic operations. The morning network peak hour generally occurred from 7:00 to 8:00 AM and the evening network peak hour generally occurred from 4:15 to 5:15 PM. Peak hour traffic flow networks for an existing weekday morning and evening peak hour are shown in Figures 4.1-11 and 4.1-12, respectively.

Crash Analysis Summary—Crash rates at the intersections analyzed were less than the District 5, and Massachusetts statewide averages. Crashes occurred over the most recent three year period from 2004 to 2006. A brief summary of the crash data shows that:

- Most of the crashes that occurred in the study area are angle type (60 percent) collisions.
- The majority of the crashes occurred during the daylight hours (70 percent) on dry roadways (80 percent).

Traffic Operations Analysis—An analysis of the existing conditions in the vicinity of the Freetown station site was performed to assess the ability of intersections to process traffic. The results of the analyses for these intersections for 2008 Existing Conditions are presented in Table 4.1-20.

Table 4.1-20 Freetown Intersection Capacity Analysis—Existing Conditions

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Unsignalized Intersections	Critical Movement	Delay[1]	LOS[2]	Critical Movement	Delay[1]	LOS[2]
Freetown Station						
S. Main St. at High St.	NW All	15	B	NW All	12	B
S. Main St. at Ridge Hill Rd.	NW All	46	E	NW All	41	E
S. Main St. at Route. 24 SB Ramps	SB L/R	16	C	SB L/R	36	E
S. Main St. at Route. 24 NB Ramps	NB L/R	41	E	NB L/R	49	E
S. Main St. at Narrows Rd.	EB L/R	16	C	EB L/R	18	C
S. Main St. at Copicut St.	WB L/R	11	B	WB L/R	11	B

Source: Synchro 7.0 Software; Build 763
1 average control delay by for the critical movement, rounded to the nearest whole second, for unsignalized intersections.
2 level of service
L= Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Under existing conditions, the Freetown station study area consists of six unsignalized intersections. Two of the unsignalized intersections currently operate at LOS E in the morning peak hour. Both those intersections as well as a third intersection operate at LOS E in the evening peak hour. These unsignalized intersections experience long delays in the evening peak hour for left-turning movements from the minor street to the major street. The delays are primarily due to the high through traffic volumes on South Main Street.

Fall River Stations Study Area (Battleship Cove Station and Fall River Depot Station)

The traffic impact study areas within the City of Fall River were selected based on the proposed commuter rail station locations. Figure 4.1-13 shows the location of the Fall River stations and selected study area intersections.

Fall River has two station locations proposed for the rail alternatives. The following paragraphs summarize the locations and features of the Battleship Cove and Fall River Depot stations.

Located within a block of Battleship Cove, the proposed Battleship Cove station is not anticipated to serve a substantial amount of regular commuter rail ridership. The station is intended, rather, to provide tourist access to the attractions at Battleship Cove with limited parking available. Traffic analysis for

existing conditions was completed for this station study area, however future conditions analysis may only focus on pedestrian circulation and improving existing infrastructure deficiencies rather than full traffic impact analysis.

The Fall River Depot station, located 1 mile north of downtown Fall River at Route 79 and Davol Street, would serve all the rail alternatives. The site is envisioned to be a multi-modal transportation center with new mixed-use development and parking facilities. The site would serve walk-in, bike-in, and drive-in customers. Access will likely be provided from either Pierce Street or North Main Street in proximity to the Route 79 corridor.

Existing Traffic Volumes—Traffic volume data for the Battleship Cove station and Fall River Depot station were collected in September and October 2008 and included ATR counts and manual TMCs.

For the Battleship Cove station study area, ATR data were collected at the North Davol Street northbound U-turn, which merges with Davol Street Southbound near Cedar Street. Table 4.1-21 presents a summary of the daily and peak hour volumes.

As presented in Table 4.1-21, the North Davol Street U-turn (to Davol Street southbound) carries approximately 500 vehicles per day (vpd) on a typical weekday, with approximately 45 vehicles during the weekday morning peak hour and 40 vehicles during the weekday evening peak hour. The Davol Street U-turn to South Davol Street northbound carries twice as much on a daily basis. North Davol Street, south of President Avenue in the vicinity of the Fall River Depot station carries approximately 8,000 vpd northbound. Davol Street in the same area carries 10,000 vpd southbound on a typical weekday. In the morning peak hour approximately 500 vehicles travel northbound and 850 vehicles travel southbound, while in the evening peak hour 500 vehicles travel northbound and 650 vehicles travel southbound.

Table 4.1-21 Existing Traffic Volumes–Fall River

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location	Daily Weekly Traffic [1]	Vol. (vph)[2]	"K" Factor[3]	Peak Directional Flow[4]	Vol. (vph)	"K" Factor	Peak Directional Flow
S. Davol St. U-Turn, near Cedar St.	500	45	9.1%	NB 100%	40	8.1%	NB 100%
Route 79 NB Off-Ramp, north of President Ave.	6,400	435	6.8%	NB 100%	335	5.3%	NB 100%
Davol St. U-Turn, near Cedar St.	1,000	120	11.8%	SB 100%	65	6.4%	SB 100%
Route 79 NB Off-Ramp, south of N. Davol St. U-Turn	3,400	270	7.9%	NB 100%	200	5.9%	NB 100%
N. Davol St., south of President Ave.	8,100	525	6.4%	NB 100%	525	6.4%	NB 100%
Davol St., south of President Ave.	10,800	830	7.7%	SB 100%	635	5.9%	SB 100%

Based on ATR counts conducted in September and October 2008.
1 average daily traffic (ADT) volume expressed in vehicles per day
2 peak period traffic volumes expressed in vehicles per hour
3 percent of daily traffic that occurs during the peak period
4 directional distribution of peak period traffic
Note: peak hours do not necessarily coincide with the peak hours of the individual intersection turning movement counts

The TMCs were collected during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak periods at each of the study area intersections. These volumes were reviewed, balanced and rounded to the nearest five to develop the traffic volume networks used to evaluate existing traffic operations. The morning network peak hour generally occurred from 7:15 to 8:15 AM and the evening network peak hour generally occurred from 4:15 to 5:15 PM. Peak hour traffic flow networks for an existing weekday morning and evening peak hour are shown in Figures 4.1-14 and 4.1-15.

Crash Analysis Summary—Crash rates at the following Fall River intersections exceed the statewide average:

- North Davol Street at President Avenue (2.42 vs. 0.84 – 60 crashes)
- North Main Street at President Avenue (1.14 vs. 0.84 – 29 crashes)
- Water Street at Anawan Street (0.63 vs. 0.59 – 4 crashes)

A total of 117 crashes occurred over the three-year period from 2004 to 2006, with the majority (76 percent) occurring at the intersection of North Davol Street at President Avenue. A brief summary of the crash data shows that:

- Most of the crashes that occurred in the study are angle type (44 percent) and rear-end type (31 percent) collisions.
- There were no fatalities between the years 2004 and 2006.

Traffic Operations Analysis—An analysis of the existing conditions in the vicinity of the Fall River Depot station and Battleship Cove station was performed to assess the ability of intersections to process traffic. The results of the analyses for these intersections for 2008 Existing Conditions are presented in Table 4.1-22.

The Battleship Cove station study area consists of four unsignalized intersections. The Central Street at Davol Street intersection operates at LOS E in the morning and LOS F in the evening peak hours. This intersection experiences long delays due to heavy westbound movements from the minor street (Central Street). Anawan Street at Davol Street is an all-way STOP-controlled intersection that currently operates at LOS F in the morning and evening peak hours. This intersection experiences long delays due to heavy southbound movement from Anawan Street onto Davol Street.

Under existing conditions, the Fall River Depot station study area consists of three signalized and four unsignalized intersections. All of the signalized and unsignalized intersections provide a good LOS (LOS C or better) in both the morning and evening peak hours.

Table 4.1-22 Fall River Intersection Capacity Analysis—Existing Conditions

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Signalized Intersections	V/C [1]	Delay [2]	LOS [3]	V/C	Delay	LOS
Fall River Depot Station						
N. Main St. at President Ave.	0.73	21	C	0.82	26	C
N. Davol St. at President Ave.	0.48	20	B	0.62	20	B
Davol St. at President Ave.	0.63	28	C	0.58	19	B
Unsignalized Intersections	Critical Movement	Delay [4]	LOS	Critical Movement	Delay	LOS
Fall River Depot Station						
N. Davol St at Pearce St	WB R	12	B	WB R	14	B
N. Davol St at Turner St	WB R	13	B	WB R	14	B
Davol St at northern U-turn near Cedar St (Davol SB to NB)	NE L	12	B	NE L	12	B
N. Davol St at southern U-turn near Cedar St (S. Davol NB to SB)	SW L	13	B	SW L	13	B
Battleship Cove Station						
Water St at Anawan St	EB All	15	C	WB All	15	C
Ferry St at Ponta Delgada St	EB L/R	14	B	EB L/R	12	B
Anawan St at Davol St	SB All	>50	F	SB All	>50	F
Central St at Davol St	WB L	45	E	WB L	>50	F

Source: Synchro 7.0 Software; Build 763
1 volume-to-capacity ratio
2 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
3 level of service
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound
Shaded rows reflect worst level of service intersections (LOS = F)

Taunton Stations Study Area (Taunton Station, Dana St. Station and Taunton Depot Station)

The traffic impact study areas within the City of Taunton were selected based on the proposed commuter rail station locations. Figure 4.1-16 shows the location of the various Taunton stations and selected study area intersections.

There are three proposed stations located in Taunton, the Taunton, Taunton Depot, and Dana Street Stations. Although only the Taunton Depot Station is located in the Southern Triangle, all three stations are addressed in this section.

The Taunton Depot station, located at the rear of Target Plaza, would serve the Stoughton and Whittenton Alternatives. This station site is approximately 14 acres and is located off of Route 140. The station would serve customers that drive to the station, as well as potential future walk-in or bike-in customers if redevelopment were to occur in the area.

The Taunton station, located along Arlington Street near Dean Street (Route 44), would serve the Stoughton Alternative. The location is within walking distance of downtown Taunton. The station would be a multimodal transportation center serving walk-in, bike-in, and drive-in customers.

Since the DEIS/DEIR, the Downtown Taunton Station site has been developed and is no longer available for the South Coast Rail project. The Dana Street Station would instead become the station that serves the Whittenton Alternative. The Dana Street Station is approximately 0.5 mile north of the previously-proposed Downtown Taunton Station and would be served by many of the same roadways that provided access to the Downtown Taunton Station.

Existing Traffic Volumes—Traffic volume data for the Taunton Depot and Taunton stations were collected in September and October 2008 and included ATR counts and manual TMCs. Table 4.1-23 presents a summary of the daily and peak hour traffic volumes. The highest daily two-way volume for an undivided roadway was almost 29,000 vehicles on Route 44 (Dean Street) west of Route 104. The peak hour volumes at that location were also the highest with 1,850 and 1,975 vehicles, respectively, in the morning and evening. The highest daily volume in one direction was about 22,700 vehicles on Route 140 westbound between the Route 24 ramps. The eastbound direction in that location carried about 12,400 vehicles for a daily two-way volume of 35,100.

Table 4.1-23 Existing Traffic Volumes—Taunton Stations Study Area

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location	**Daily Weekly Traffic [1]**	**Vol. (vph)[2]**	**"K" Factor[3]**	**Peak Directional Flow[4]**	**Vol. (vph)**	**"K" Factor**	**Peak Directional Flow**
Dean St/Route 44, west of Route 104	28,840	1,850	6.4%	EB 54%	1,975	6.8%	WB 56%
Winter St., south of King St	11,490	825	7.2%	NB 53%	1,070	9.4%	SB 52%
Dean St./Route 44, west of Prospect St.	19,560	1,255	6.4%	WB 51%	1,365	7.0%	WB 54%
County St./Route 140, east of Gordon Owen	21,390	1,390	6.5%	NB 60%	1,645	7.7%	SB 58%
Oak St., west of Maple St.	11,090	770	6.9%	EB 65%	840	7.6%	WB 55%
Tremont St., north of Washington St.	16,850	1,190	7.1%	SB 55%	1,355	8.1%	NB 52%
Washington St., east of Park St.	14,130	940	6.7%	EB 62%	1,070	7.6%	WB 59%
Frederick Martin Parkway, west of Cohannet St.	8,240	540	6.6%	SB 56%	715	8.7%	SB 67%
Route 140 EB between Route 24 Ramps	22,730	1,170	5.2%	EB 100%	2,315	10.2%	EB 100%
Route 140 WB between Route 24 Ramps	12,360	1,370	10.7%	WB 100%	1,005	8.1%	WB 100%
Route 140 EB east of Stevens St (Exit 11)	15,950	810	5.1%	EB 100%	1,740	10.9%	EB 100%
Route 140 WB east of Stevens St (Exit 11)	16,630	1,590	9.5%	WB 100%	1,050	6.3%	WB 100%

Based on ATR counts conducted in September and October 2008.
1 average daily traffic (ADT) volume expressed in vehicles per day
2 peak period traffic volumes expressed in vehicles per hour
3 percent of daily traffic that occurs during the peak period
4 directional distribution of peak period traffic
Note: peak hours do not necessarily coincide with the peak hours of the individual intersection turning movement counts

Crash Analysis Summary—A total of 345 crashes occurred in the Taunton study area over the three-year period from 2004 to 2006. Crash rates at the following eight intersections were all higher than the District 5 and Massachusetts statewide averages.

- Hart Street at County Street/Route 140
- Stevens Street /County St at Route 140 NB Ramps/Galleria Mall Ramp
- Kilmer Street at Lowell St at Oak Street
- Post Office Square at Taunton Green Street at Court Street
- Longmeadow Road/Hon Gordon Owen Riverway at Dean Street/Route 44
- School Street at Arlington Street /Purchase Street
- Spring Street at Summer Street (Route 140)
- Winter Street at School Street
- Purchase Street at Washington Street (This intersection had an extremely high calculated crash rate of 3.77 [vs. a District 5 average of 0.59]. There was a large occurrence of angle type collisions [92 percent] that may be due to the large northbound left turn movement.)

A brief summary of the crash data shows that:

- 62 percent of all the crashes involved property-damage only. Twenty-nine percent of the crashes involved a non-fatal injury
- 57 percent of the crashes were angle-type collisions

Traffic Operations Analysis—An analysis of the existing conditions in the vicinity of the Taunton Depot and Taunton stations was performed to assess the ability of intersections to process traffic. The results of the analyses for these intersections for 2008 Existing Conditions are presented in Table 4.1-24.

Under existing conditions, the Taunton Depot station study area consists of seven signalized intersections. Only one location operates at a deficient LOS. Route 140 at the Route 24 southbound ramps operates at LOS F in the evening peak hour due to long delays for the left-turning eastbound traffic from the Route 24 ramp. It appears that the delay is primarily due to lack of adequate capacity to accommodate the high traffic volume on the Route 140 southbound approach.

Peak hour traffic flow networks for an existing weekday morning and evening peak hour are shown in Figures 4.1-17 and 4.1-18.

The Taunton station study area consists of seven signalized and three unsignalized intersections. All of the signalized intersections provide a good LOS in both the morning and evening peak hours except for Route 44 at Longmeadow Road, which operates at a LOS F and E during the morning and evening peak hours, respectively. One unsignalized intersection operates at LOS F in both the morning and evening peak hours and another operates at LOS F in the evening peak hour. These locations experience long

delays for the minor street movements that are unable to find suitable gaps in the main street traffic. The delays are primarily due to the high through traffic volumes on the major street.

Table 4.1-24 Taunton Intersection Capacity Analysis—Existing Conditions

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Signalized Intersections	**V/C [1]**	**Delay [2]**	**LOS [3]**	**V/C**	**Delay**	**LOS**
Taunton Depot Station						
Route. 140 at Hart St.	0.81	38	D	0.92	41	D
Route. 140 at Route. 24 SB Ramps	0.80	28	C	>1.00	>80	F
Route. 140 at Route. 24 NB Ramps	0.84	5	B	0.65	3	A
Route. 140 at Taunton Depot Dr.	0.53	14	B	0.57	19	B
Route. 140 at Mozzone Boulevard	0.42	2	A	0.83	13	B
Route. 140 NB Ramps at Stevens St.	0.29	12	B	0.38	13	B
County St. at Silver City Galleria Mall Entrance/Exit	0.07	4	A	0.38	7	A
Taunton Station						
Route. 138 at Washington St	0.72	32	C	0.84	43	D
Route 44 at Dean St. /Route. 104	0.71	8	A	0.65	11	B
Route 44 at Longmeadow Rd	>1.00	>80	F	>1.00	65	E
Route 44 at Arlington St	0.93	34	C	0.95	41	D
Main St. at Union St.	0.87	29	C	0.84	27	C
Spring St at Summer St	0.67	24	C	0.75	25	C
Summer St at Hon. Gordon Owen Riverway	0.73	16	B	0.92	33	C
Unsignalized Intersections	**Critical Movement**	**Delay[1]**	**LOS[2]**	**Critical Movement**	**Delay**	**LOS**
Taunton Station						
Arlington St at School St	NB All	15	C	NB All	25	D
Washington St at Purchase St	SB All	23	C	NB All	>50	F
School St at Winter St	SB All	>50	F	SB All	>50	F

Source: Synchro 7.0 Software; Build 763
1 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
2 level of service
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound
Shaded rows reflect worst level of service intersections (LOS = F).

Stoughton Alternatives

Relocated Stoughton Station Study Area

Existing traffic conditions and impacts that could result from the South Coast Rail project in the vicinity of the existing Stoughton Station were not evaluated as part of the DEIS/DEIR because no changes to parking at this station were proposed at the time. As discussed in Chapter 3, subsequent to the DEIS/DEIR, MassDOT has proposed relocating Stoughton Station. The station would be shifted from its present location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing. As a result, an inventory of existing transportation conditions and potential impacts was prepared to address the change in the location of the station platform, consolidation of parking and addition of new station driveways; and the increase in the number of parking spaces.

A field inventory of traffic conditions on study area roadways was conducted in April 2012. Nine intersections were included in the study area (Figure 4.1-19). Descriptions of intersection and roadway geometry, along with field inventory notes are provided in Appendix 4.1-K.

Existing Traffic Volumes—Traffic volume data for the intersections shown in Figure 4.1-19 were collected in April 2012. TMCs were conducted at the entrance and exit points to the existing MBTA parking lot driveways. Figure 4.1-19 shows the study area intersections as well as the entrance and exit locations of the existing MBTA parking lots.

Forty-eight hour ATR data were collected along Washington Street and Brock Street. Table 4.1-25 presents a summary of the recorded ATR volumes on a daily basis and during peak hours.

Traffic volumes include about 3,300 daily vehicles along Brock Street and 13,550 daily vehicles along Washington Street. Peak hour traffic represents 6 to 10 percent of the overall daily volume on the roadway network, meaning that there is a constant flow of traffic traveling along these roadways during the majority of the day.

Speed data were also collected along Washington Street and Brock Street in the locations described above. The average speeds along Washington Street and Brock Street were 33 mph and 26 mph, respectively.

Table 4.1-25 Stoughton Station Existing Traffic Volumes

Location	Daily Weekday[2]	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
		Vol[3]	K Factor[4]	Dir. Dist.[5]	Vol	K Factor	Dir. Dist.
Washington Street, north of Brock Street	13,550[1]	900	6.7	64% NB	1,170	8.6	67% SB
Brock Street, west of the railroad tracks	3,260[1]	350	10.7	60% WB	350	10.7	54% WB

Source: Daily and peak hour traffic counts
1 based on automatic traffic recorder counts conducted in April 2012.
2 average daily traffic volume expressed in vehicles per day
3 expressed in vehicles per hour
4 percent of weekday daily traffic that occurs during the peak hour
5 directional distribution of traffic

Crash Analysis Summary—Appendix 4.1-K provides the vehicle crash data for the study area intersections between 2007 and 2009. The crash data show that angle crashes were the leading type of crashes, followed by rear end crashes. The majority of crashes occurred on dry pavement, during off-peak times on a weekday. Approximately 74 percent of crashes resulted in property damage only.

During the 3-year period, the intersection of Pleasant Street at Park Street/ Washington Street had the highest number of crashes (35), which included a crash that involved a bicyclist. Wyman Street at Washington Street and Brock Street/ Kinsley Street at Washington Street were the intersections with the next highest number of accidents, with 23 accidents and 22 accidents, respectively.

Pleasant Street at Park Street/Washington Street exceeds both the state and district crash rate. For unsignalized intersections, Brock Street at Morton Street and Wyman Street at Brock Street are the only intersections with crash rates below the state and district crash rates. Crash rate calculations are provided in Appendix 4.1-K.

Traffic Operations Analysis—The existing traffic operations conditions were determined using the existing traffic volume networks. The morning and evening peak hour volume networks are depicted in Figures 4.1-20 and 4.1-21. The results of the signalized and unsignalized intersection capacity analyses for each of the study area intersections are summarized in Table 4.1-26 and 4.1-27, respectively. Complete traffic operations data for each location are provided in Appendix 4.1-K.

Table 4.1-26 Stoughton Station Existing Conditions Signalized Intersection Capacity Analysis

		Existing Conditions		
Location	**Period**	**v/c[1]**	**Delay[2]**	**LOS[3]**
Porter Street at Washington Street	Weekday Morning	0.69	21	C
	Weekday Evening	0.90	49	D
Pleasant Street at Park Street/ Washington Street	Weekday Morning	0.92	36	D
	Weekday Evening	0.79	24	C

Source: Synchro 7 (Build 773, Rev 8) software
Notes:
1 volume-to-capacity ratio
2 average delay in seconds per vehicle
3 level of service

As shown in Table 4.1-26, both signalized intersections operate at acceptable levels of service under existing conditions. As indicated in Table 4.1-27, stop-controlled approaches to three unsignalized study area intersections operate at unacceptable LOS E or LOS F conditions.

Two intersections in the Stoughton Station study area experience excess queues during peak hours:

- The queue for eastbound Porter Street at the intersection with Washington Street exceeds the available storage length by approximately 60 feet during the evening peak hour. The northbound left-turn lane queue on Washington Street exceeds the available storage length by approximately 350 feet during the morning and evening peak hour. The queue on Southbound Washington Street exceeds the available storage length by 450 feet.

- For the intersection of Pleasant Street at Park Street/Washington Street, the northbound, southbound left turn, and through lanes on Park Street all experience queues that are longer than the available storage length during both the morning and evening peak hour.

Average queues for all lanes at the study area intersections are accommodated with two exceptions on Washington Street: the northbound left-turn lanes and southbound through lanes between the intersections with Freeman Street and Porter Street. The average queue is 120 feet in excess of available storage along the northbound direction and 60 feet in the southbound direction. See Appendix 4.1-K for details of the queue analysis.

Table 4.1-27 Stoughton Station Existing Conditions Unsignalized Intersection Capacity Analysis

Location	Critical Movement	Morning Peak Hour				Evening Peak Hour Condition			
		Dem[1]	v/c[2]	Del[3]	LOS[4]	Dem	v/c	Del	LOS
Porter Street at Washington Street	WB RT	15	0.07	14	B	25	0.08	12	B
Freeman Street at Washington Street	WB RT	10	0.19	52.4	F	15	0.12	29	D
Wyman Street at Washington Street	EB RT	125	0.32	16	C	125	0.42	22	C
Morton Street/Trackside Plaza South Drive/MBTA Lot Driveway at Wyman Street	EB LT-TH-RT	290	0.09	3	A	130	0.02	1	A
	WB LT-TH-RT	65	0	1	A	140	0	1	A
	NB LT-TH-RT	Neg	0.01	14	B	5	0.04	14	B
	SB LT-TH-RT	10	0.04	11	B	30	0.07	10	B
Summer Street at Wyman Street	EB LT-RT	30	0.04	9	A	65	0.07	9	A
Brock Street at	EB LT-TH-RT	120	0.62	40	E	145	1.13	>120	F
Washington Street	WB LT-TH-RT	50	0.32	30	D	70	1.08	>120	F
	NB LT-TH-RT	410	0.14	4	A	465	0.09	3	A
	SB LT-TH-RT	345	0	0	A	775	0.01	1	A
Brock Street at Morton Street	EB LT-TH-RT	60	0.10	9	A	75	0.12	9	A
	WB LT-TH-RT	205	0.37	11	B	160	0.30	10	A
	NB LT-TH-RT	220	0.42	11	B	80	0.16	9	A
	SB LT-TH-RT	75	0.16	9	A	155	0.30	10	A
Brock Street at Wyman Street	WB LT-RT	95	0.13	9	A	115	0.15	10	A
Park Avenue/Sumner Street at	EB LT	205	>1.20	>120	F	120	1.05	>120	F
Park Street	EB TH-RT	15	0.05	16	C	25	0.10	18	C
	WB LT-TH-RT	20	0.09	21	C	50	0.26	23	C

Source: Synchro 7 (Build 773, Rev 8) software
Note: Shaded cells denote LOS E/F conditions.
1 demand in vehicles per hour for unsignalized intersections
2 volume-to-capacity ratio for the critical movement, values over 1.0 indicate demand in excess of capacity.
3 Control delay per vehicle, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
4 level of service of the critical movement
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = left-turn; TH = through; RT = right-turn, Neg = negligible

Pedestrians and Bicycles—Stoughton Station is currently accessible via Porter Street, Wyman Street, Morton Street, Brock Street and Washington Street. Sidewalks are provided on the east side of Morton Street, north side of Brock Street and along both sides of Porter Street, Wyman Street and Washington Street.

Parking—Parking for Stoughton Station commuters is currently provided in a number of parking lots accessible from Porter Street, Wyman Street and Washington Street.

Public Transportation—The Providence/Stoughton Line is the only public transportation provided by the MBTA in this area. The existing Stoughton Station ridership is approximately 1,050 inbound boardings per day. The Brockton Area Transit Authority (BAT) provides a bus service between the Brockton Area Transit Center and Cobbs Corner via Washington Street with stops at the Westgate Mall, south of the study area, along Washington Street, and a terminal stop at Cobbs Corner, north of the study area. BAT provides services Monday through Saturday between 6:00 AM and 6:00 PM.

Easton Station Study Area

The traffic impact study areas within the Town of Easton were selected based on the locations of the proposed commuter rail stations. Figure 4.1-22 shows the location of the Easton stations and selected study area intersections.

Easton has two station locations proposed for the Stoughton Alternative. The following paragraphs summarize the locations and features of the Easton Village and North Easton stations.

The Easton Village station is proposed to be located next to the Old Colony Railroad Station which is part of the discontiguous H.H. Richardson National Historic Landmark. The site is currently limited to the railroad right-of-way and is within walking distance of downtown Easton. The site would be a village-style station serving walk-in and bike-in customers. No commuter parking would be provided, however approximately 12 kiss and ride spaces would be designated in an existing private lot. Traffic analysis for existing conditions was completed for this station study area, however, future conditions analysis may only focus on pedestrian circulation and improving existing infrastructure deficiencies rather than full traffic impact analysis.

The North Easton station is proposed on the Stoughton town line at the rear of the Roche Brothers plaza and accessible from an existing traffic signal on Route 138. The station would have a surface parking lot and would primarily serve drive-in customers, although the station may also attract some walk-in customers from the existing plaza development and from limited nearby residences.

Existing Traffic Volumes—Traffic volume data for the Easton Village and North Easton stations within the Easton study area were collected in September 2008 and included ATRs and manual TMCs. Table 4.1-28 presents a summary of the daily and peak hour volumes. Route 138 north of Elm Street carries the highest traffic volumes near the North Easton station. It carries approximately 19,500 vehicles per day (vpd) on a typical weekday, with approximately 1,700 vehicles during the morning peak hour and 1,650 vehicles during the evening peak hour.

The TMCs were collected during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak periods. The volumes were reviewed, balanced and rounded to the nearest five to develop the traffic volume networks used to evaluate existing traffic operations. The network morning peak hour occurred from 7:15 to 8:15 AM and the network evening peak hour occurred from 4:45 to

5:45 PM. Peak hour traffic flow networks for an existing weekday morning and evening peak hour are shown in Figures 4.1-23 and 4.1-24, respectively.

Table 4.1-28 Existing Traffic Volume Summary–Easton

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location	Daily Weekly Traffic [1]	Vol. (vph)[2]	"K" Factor[3]	Peak Directional Flow[4]	Vol. (vph)	"K" Factor	Peak Directional Flow
Route 138, south of Main St.	17,000	1,395	8.2%	NB 61%	1,415	8.3%	SB 53%
Route 138, north of Elm St.	19,400	1,690	8.7%	NB 75%	1,660	8.6%	SB 60%
Route 138, north of Roche Bros.	15,200	1,455	9.6%	NB 72%	1,355	8.9%	NB 62%
Main St, east of Center St.	13,600	1,160	8.5%	EB 76%	1,140	8.3%	WB 60%

Based on ATR counts conducted in September and October 2008.
1 average daily traffic (ADT) volume expressed in vehicles per day
2 peak period traffic volumes expressed in vehicles per hour
3 percent of daily traffic that occurs during the peak period
4 directional distribution of peak period traffic
Note: peak hours do not necessarily coincide with the peak hours of the individual intersection turning movement counts

It should be noted that the Central Street Bridge was closed during the initial data collection period. Subsequent traffic counts were conducted in 2009 and traffic volumes did not change within the Route 138 and Center Street corridors.

Crash Analysis Summary—A total of 79 crashes occurred in the Easton study area over three-year period from 2004 to 2006. Only the crash rate at the intersection Elm Street at North Main Street exceeded the MassDOT District 5 average crash rate. The following summarizes the crash data:

- The majority of the crashes in the area appear to be at the intersections of Route 138/Washington Street at Elm Street (17 crashes), and Route 138/Washington Street at Main Street (24 crashes);
- Fifty-nine percent of all the crashes in this area were angle-type collisions; and
- Sixty-five percent of the crashes involved property damage only. Twenty-seven percent of the crashes involved injury to one or more persons. None of the crashes were fatal.

Traffic Operations Analysis—An analysis of the existing conditions in the vicinity of East Village station and North Easton station was performed to assess the ability of intersections to process traffic. The results of the analyses for these intersections for 2008 Existing Conditions are presented in Table 4.1-29.

Under existing conditions, the North Easton station study area consists of one signalized and two unsignalized intersections. The signalized intersection provides a good LOS in both the morning and evening peak hours. The two unsignalized intersections on Route 138 operate at a LOS F in the morning and evening peak hours. These intersections experience long delays for the minor street traffic that is unable to find suitable gaps in the main stream traffic. The delays are primarily due to high through traffic volumes on Route 138.

Table 4.1-29 Easton Intersection Capacity Analysis—Existing Conditions

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Signalized Intersections	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
North Easton Station						
Rt. 138 at Roche Bros. Way	0.71	12	B	0.66	13	B
Easton Village Station						
Rt. 138 at Belmont St./Rt. 123	0.70	15	B	>1.00	43	D
Rt. 138 at Main St.	0.82	>80	F	0.89	39	D
Unsignalized Intersections	Critical Movement	Delay[4]	LOS	Critical Movement	Delay	LOS
North Easton Station						
Rt. 138 at Elm St.	Elm WB All	>50	F	Elm WB All	>50	F
Rt. 138 at Union St.	Union WB L/R	>50	F	Union WB L/R	>50	F
Easton Village Station						
Elm St. at North Main St.	Elm WB L/R	13	B	Elm WB L/R	14	B
Main St. at Center St. at Lincoln St.	Center NB All	>50	F	Center NB All	>50	F
Lincoln St. at Barrows St.	Barrows NB All	11	B	Barrows NB All	21	C
Rt. 138 at Roosevelt Circle	Roosevelt EB L	45	E	Roosevelt EB L	24	C

Source: Synchro 7.0 Software; Build 763
1 volume-to-capacity ratio
2 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
3 level of service
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections.
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound
Shaded rows reflect the worst level of service intersections (LOS = F).

The Easton Village station study area consists of two signalized and four unsignalized intersections. One of the signalized intersections (Route 138 at Main Street) operates at a LOS F in the morning peak hour due to heavy eastbound left-turning movements from Main Street that cannot be processed through the intersection in the allocated green time. The unsignalized intersection of Main Street at Center Street and Lincoln Street operates at LOS F in both the morning and evening peak hours. Roosevelt Circle at Route 138 operates at LOS E in the morning peak hour. These intersections experience long delays for the minor street traffic that is unable to find suitable gaps in the main road traffic. The delays are primarily due to the high traffic volume on Route 138.

Raynham

The traffic impact study areas within the Town of Raynham were selected based on the locations of the proposed commuter rail station. Figure 4.1-25 shows the location of the Raynham Park station and selected study area intersections.

The Raynham Park station, located at the former Raynham-Taunton Greyhound Park in Raynham, would serve the Stoughton Alternative. The site is now occupied by a simulcast center, and has a large surface parking lot along Route 138 near the Raynham/Easton town line. The site would serve mostly drive-in customers with additional walk-in customers being drawn from planned redevelopment on the site.

Existing Traffic Volumes—Traffic volume data for the Raynham Park station were collected in September 2008 and included ATR counts and manual TMCs. ATR data were collected at Route 138

north of the Dog Track. Table 4.1-30 presents a summary of daily and peak hour volumes. Route 138 carries 17,000 vehicles daily and 1,460 and 1,560 vehicles, respectively in the morning and evening peak hours.

Table 4.1-30 Existing Traffic Volume Summary–Raynham

		Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Location	Weekly Daily Traffic[1]	Vol. (vph)[2]	"K" Factor[3]	Peak Directional Flow[4]	Vol. (vph)	"K" Factor	Peak Directional Flow
Route 138, north of Dog Track	17,060	1,460	8.6%	NB 76%	1,560	9.2%	SB 67%

Based on ATR counts conducted in September 2008.
1 average daily traffic (ADT) volume expressed in vehicles per day
2 peak period traffic volumes expressed in vehicles per hour
3 percent of daily traffic that occurs during the peak period
4 directional distribution of peak period traffic
Note: peak hours do not necessarily coincide with the peak hours of the individual intersection turning movement counts

Crash Analysis Summary—A total of 34 crashes occurred during the three-year period from 2004 to 2006 in the Raynham study area. Crash rates at all intersections were less than the District 5 and Massachusetts statewide averages. The following summarize some of the crash data:

- Forty-six percent of all crashes in this area are angle-type collisions.
- Forty-nine percent of the crashes in this area contained damage to property only.
- Thirty-two percent of the crashes involved a non-fatal injury. No fatal crashes occurred in this area.

Traffic Operations Analysis—An analysis of the existing traffic operating conditions in the vicinity of the Raynham Park station was performed to assess the ability of intersections to process traffic. The results of the analyses for these intersections for 2008 Existing Conditions are presented in Table 4.1-31.

The Raynham Park station study area consists of three signalized and eight unsignalized intersections. Under existing conditions, all the signalized intersections provide a good LOS in both the morning and evening peak hours.

Five of the unsignalized intersections operate at LOS E or F in both the morning and evening peak hours. These intersections experience long delays for the minor street traffic that is unable to find suitable gaps in the high volume of Route 138 through traffic. Peak hour traffic flow networks for an existing weekday morning and evening peak hours are shown in Figures 4.1-26 and 4.1-27, respectively.

Table 4.1-31 Raynham Intersection Capacity Analysis–Existing Conditions

	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
Signalized Intersections	V/C[1]	Delay[2]	LOS[3]	V/C	Delay	LOS
Raynham Park Station						
Route 138 at Route 106 (Foundry St)	0.81	19	B	0.93	28	C
Route 138 at Elm St.	0.70	21	C	0.68	19	B
Route 138 at Carver St.	0.79	14	B	0.85	18	B
Unsignalized Intersections	Critical Movement	Delay[4]	LOS	Critical Movement	Delay	LOS
Raynham Park Station						
Route 138 at Wilbur St.	Wilbur WB L/R	33	D	Wilbur WB L/R	30	D
Route 138 at I-495 NB On/Off-Ramp	I-495 Ramp WB All	>50	F	I-495 Ramp WB All	>50	F
Route 138 at I-495 SB On/Off-Ramp	I-495 Ramp EB All	>50	F	I-495 Ramp EB All	>50	F
Route 138 at Center St.	Center WB L	>50	F	Center WB L	>50	F
Route 138 at Britton St. (East)	Britton WB L/R	>50	F	Britton WB L/R	>50	F
Route 138 at Britton St. (West)	Britton EB L/R	38	E	Britton EB L/R	>50	F
Route 138 at Robinson St.	Robinson WB L/R	26	D	Robinson WB L/R	13	B
Route 138 at Dog Track driveway	Driveway EB All	36	C	Driveway EB All	34	D

Source: Synchro 7.0 Software; Build 763
1 volume-to-capacity ratio
2 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
3 level of service
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound
Shaded rows reflect the worst level of service intersections (LOS = F)

4.1.4 Analysis of Impacts by Alternative

4.1.4.1 No-Build (Enhanced Bus) Alternative

The No-Build Alternative includes enhanced bus service. The impact analysis of the No-Build Alternative is focused on the roadways serving each station in the study area and analyzes its impact on traffic operations. No analyses of pedestrian and bicycle conditions, parking, or public bus transit service were conducted for the No-Build Alternative because they are not expected to change near proposed station locations. The purpose of the No-Build analysis is to provide a base against which the results of the analysis of the Build Alternatives can be compared to determine the impacts of each Build Alternative.

The No-Build (Enhanced Bus) Alternative consists of potential transportation improvements for the Boston commute to and from South Coast communities that could be implemented at minimal cost and limited impact to the environment. Currently, South Coast commuters to Boston must drive (alone, or in a carpool), commute to the nearest bus station, commute to a park-and-ride facility, or commute to a MBTA commuter rail station. The closest existing MBTA commuter rail stations with linkage to Boston are located outside the South Coast region in Attleboro, South Attleboro, Mansfield, and Lakeville. Refer to Chapter 3 for a detailed description of the No-Build Alternative.

Background Development/Infrastructure Improvements

While the CTPS travel demand model accounts for the majority of future development areas within its demographic forecasts, a number of large development projects were not specifically included in the

model's future land use assumptions. Identification of these projects was coordinated with the Massachusetts Environmental Policy Act office, MassDOT Highway Division, SRPEDD, and OCPC. The No-Build Alternative transportation analysis includes travel demands from these specific planned developments in the study area, roadway improvements planned or programmed to be completed by or before 2030, and bus service improvements. These development projects and transportation improvements, including bus enhancements, are described in detail in Appendix 4.1-L. The existing traffic volume networks were projected into future conditions using annual traffic growth factors combined with project-specific traffic volumes to the traffic volumes to create the 2030 No-Build condition traffic volume networks, which are depicted in Figures 4.1-28 through 4.1-43.

Traffic Operations Analysis

The following section describes how the No-Build (Enhanced Bus) Alternative was analyzed for traffic operations. Traffic operations on Route 24, Route 140, I-93, Route 138, and at the driveways to new and expanded park-and-ride facilities were analyzed to assess the impact of the enhanced bus service under 2030 No-Build conditions. Intersections around each proposed rail station location were analyzed to establish a base condition for projecting traffic impacts from the rail alternatives.

Traffic operations were analyzed for the No-Build Alternative using the methodology previously described. The results of these analyses are presented in tables that include existing LOS and highlight locations that would operate at unacceptable levels of service during at least one peak hour. Intersections that would degrade to unacceptable levels of service under 2030 No-Build conditions are denoted in **bold**. LOS analyses for all highways and intersections are provided in Appendix 4.1-I

CTPS provided ridership projections by transportation mode for the South Coast Rail project in the 2030 horizon year as well as projections for future traffic growth along the major corridors between Boston and the South Coast. The No-Build Enhanced Bus Alternative ridership projections and projected freeway volumes were used to analyze expected future traffic conditions. Traffic volume estimates from the specific No-Build development projects were added to the CTPS traffic volume projections to create the 2030 No-Build condition traffic volume networks, which are shown in Figures 4.1-28 through 4.1-43.

The freeway analysis includes 11 locations on Route 24, Route 140, and I-93. The highway analysis was conducted for two locations on Route 138 in Taunton and Easton. Intersection analyses were conducted for the park-and-ride facility driveways on West Center Street in West Bridgewater and on Mt. Pleasant Street and Acushnet Street in New Bedford. The analysis results for intersections near each proposed rail stations are presented by municipality below.

Freeways/Highways

LOS was reviewed on two freeway segments on I-93, nine segments on Route 24, and two segments on Route 140. Table 4.1-32 provides the results of the freeway operations analysis. The results of the analysis indicate that freeway levels of service are expected to decline in the peak direction (northbound in the morning peak hour and southbound in the evening) on a number of segments. Typically, there is a one-letter grade reduction at each location. On eleven segments, the decline results in a deficient LOS, especially in the northbound direction during the morning peak hour. The most dramatic changes would occur near the Fall River-Freetown line in the vicinity of the new Exit 8A interchange because of proposed new development in that area.

Table 4.1-32 2030 No-Build Freeway Capacity Analyses Summary

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	2030 No-Build			Existing	2030 No-Build		
Location/Direction	LOS[1]	Volume[2]	Density[3]	LOS	LOS	Volume	Density	LOS
I-93, south of Furnace Brook Pkwy.								
Northbound Travel Lane	E	8760	>45.0	F	C	5450	25.2	C
Southbound Travel Lane	C	5220	24.1	C	D	8100	39.7	E
I-93, south of Route 3								
Northbound Travel Lane	C	6645	28.1	D	C	4880	19.8	C
Southbound Travel Lane	D	7160	30.4	D	D	8235	38.1	E
Route 24, south of I-93/Route 128								
Northbound Travel Lane	D	5700	43.4	E	B	2875	16.2	B
Southbound Travel Lane	C	3520	19.8	C	E	6830	>45.0	F
Route 24, south of Pond Street								
Northbound Travel Lane	D	5985	35.2	E	B	3445	17.5	B
Southbound Travel Lane	B	3180	17.0	B	E	6715	44.7	E
Route 24, north of Route 123								
Northbound Travel Lane	D	6050	37.1	E	B	3435	18.4	C
Southbound Travel Lane	B	2510	13.2	B	D	6100	34.2	D
Route 24, north of I-495								
Northbound Travel Lane	D	5910	35.0	E	C	3720	20.1	C
Southbound Travel Lane	B	2900	16.6	B	D	5355	30.4	D
Route 24, north of Route 44								
Northbound Travel Lane	D	5105	>45.0	F	C	3705	33.1	D
Southbound Travel Lane	B	3320	27.1	D	D	5070	>45.0	F
Route 24, north or Route 140								
Northbound Travel Lane	C	5020	>45.0	F	A	3740	33.6	D
Southbound Travel Lane	A	3520	29.2	D	C	5240	>45.0	F
Route 24, south of Route 140								
Northbound Travel Lane	A	3535	30.6	D	A	3560	30.0	D
Southbound Travel Lane	A	3285	27.8	D	C	3705	31.1	D
Route 24, north of Exit 9								
Northbound Travel Lane	A	2475	13.6	B	B	3670	37.9	E
Southbound Travel Lane	B	3460	32.9	D	C	3185	29.1	D
Route 24, south of Exit 8 ½								
Northbound Travel Lane	B	4840	>45.0	F	B	2585	21.6	C
Southbound Travel Lane	B	2740	24.7	C	C	5490	>45.0	F
Route 140, south of Route 24								
Eastbound Travel Lane	A	1320	11.5	B	B	2150	17.6	B
Westbound Travel Lane	B	1985	16.5	B	A	1590	13.3	B
Route 140, north of Hathaway Road								
Northbound Travel Lane	B	2300	18.4	C	B	2390	19.1	C
Southbound Travel Lane	C	2465	21.9	C	C	2545	22.0	C

1 Level of service
2 Vehicles per hour
3 Passenger cars/per mile/per lane

Table 4.1-33 depicts the highway operations for 2030 under the No-Build Alternative. Based on CTPS and historical growth projections, traffic volumes were projected to 2030 No-Build conditions. The results of the 2030 highway capacity analysis indicate that the two segments of the highway analyzed are expected to continue to operate at LOS D during each peak hour.

Table 4.1-33 2030 No-Build Highway Capacity Analyses Summary–Route 138

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	2030 No-Build			Existing	2030 No-Build		
Location/Movement	LOS[1]	Volume[2]	V/C[3]	LOS	LOS	Volume	V/C	LOS
Easton, south of Route 106								
North/Southbound Travel Lane	D	1570	0.53	D	D	1750	0.60	D
Taunton, south of Bay Street								
North/Southbound Travel Lane	D	1510	0.49	D	D	1760	0.57	D

1 Level of service for Class II roadway as defined by HCM CH. 12 pp. 12-12, 12-13
2 Vehicles per hour
3 Volume to capacity ratio

Intersections (Enhanced Bus Park-and-Ride Locations)

In order to evaluate the proposed access for the bus park-and-ride locations under future conditions, intersection capacity analyses were performed at driveway locations using 2030 projected traffic volumes. For the two existing park-and-ride locations, traffic volumes for the 2030 design year were projected based on the estimated annual growth rate and by adding additional vehicle trips associated with the increased ridership projections provided by CTPS. Volumes were projected using the existing fall 2008 volumes as a base, which represent a more conservative analysis than the summer 2008 volumes.

Results for the capacity analyses of the two signalized intersections providing access to the new expanded Galleria Mall park-and-ride lot in Taunton are summarized in Table 4.1-34, which also depicts the 2030 No-Build analysis at the park-and-ride lot proposed in West Bridgewater on Route 106 and at the two lots proposed in New Bedford on Mt. Pleasant Street and Acushnet Avenue (Whale's Tooth). All three locations are unsignalized.

Galleria Mall Park-and-Ride, Taunton—In order to assess the impacts of additional ridership predicted at the new expanded Galleria Mall park-and-ride in Taunton, capacity at the nearby signalized intersections that provide access to the Mall were reviewed for the 2030 No-Build Alternative. The two intersections reviewed include Stevens Street at the Route 140 Northbound Ramps and County Street at the Galleria Mall Drive/Route 140 Southbound on-ramp. The analyses assumed no geometric or traffic control changes are proposed under future 2030 conditions. The added traffic volume from the expected increase in ridership was distributed to the two intersections based on existing travel patterns. The results of the analyses indicate that the weekday morning and weekday evening peak hour LOS at the Stevens Street at Route 140 Ramps is expected to remain at LOS B under future volume conditions. Weekday morning and weekday evening peak hour LOS is expected to remain at LOS A at the intersection of County Street at Galleria Mall Drive/Route 140 southbound ramp. The results conclude that the added traffic from the expanded park-and-ride will not impact the capacity of the intersections that provide access to the site.

Table4.1-34 2030 No-Build Intersection Capacity Analyses Summary (Park-and-Ride Locations)

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	2030 No-Build			Existing	2030 No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS[1]	V/C	Delay	LOS
Galleria Park-and-Ride								
Stevens Street at Galleria Mall Drive at Route 140 Northbound Ramp	B	0.56	15	B	B	0.70	20	B
County Street at Galleria Mall Drive at Route 140 Southbound Ramp	A	0.06	3	A	A	0.54	7	A
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
W. Bridgewater Park-and-Ride								
West Center Street (Route 106) at Pleasant Street	F	Pleasant NB L/R	>50	F	F	Pleasant NB L/R	>50	F
Mt. Pleasant Street Park-and-Ride								
Mt. Pleasant Street at Park-and-Ride Drive	B	Site Dr. WB L/T	13	B	C	Site Dr. WB L/T	20	C
Whale's Tooth Park-and-Ride								
Acushnet Avenue at Whale's Tooth Park-and-Ride	N/A	Site Dr. WB L/T	11	B	N/A	Site Dr. WB L/T	11	B

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Route 106 Park-and-Ride, West Bridgewater—The proposed park-and-ride facility in West Bridgewater would use an existing driveway at the intersection of Pleasant Street and West Center Street (Route 106). No geometric or traffic control changes are proposed under future 2030 conditions. Weekday morning and evening peak hour levels of service on the West Center Street (Route 106) approach are expected to remain at LOS A and levels of service on the Pleasant Street approach are expected to remain at LOS F for future No-Build conditions. The analysis results are based on the assumption of random arrivals on the main street. The intersection should still function effectively because of the nearby signal at Manley Street, which will create gaps in traffic on West Center Street, allowing vehicles to exit Pleasant Street and the park-and-ride lot driveway.

Mt. Pleasant Street, New Bedford—At the intersection of Mt. Pleasant Street and the park-and-ride driveway in New Bedford, no geometric or traffic control changes are proposed under future 2030 conditions. Weekday morning and evening peak hour levels of service are expected to remain the same under future volume conditions, operating at LOS C or better. The intersection will function effectively with brief spikes in traffic exiting the park-and-ride lot when buses arrive.

Whale's Tooth, New Bedford—Access to the proposed Whale's Tooth park-and-ride facility in New Bedford will be provided via a new driveway on Acushnet Avenue. Traffic volumes on Acushnet Avenue

were projected to 2030 by applying an annual growth rate. Traffic volumes entering and exiting the main park-and-ride entrance in the peak hour periods were estimated based on the lot being at full capacity and 25 percent of daily users arriving during the morning peak hour and departing during the evening peak hour. The results of the capacity analysis indicate that LOS for vehicles entering and exiting the park-and-ride will be LOS B or better during each of the peak hours.

Intersections (Rail Station Areas)

New Bedford—No-Build conditions in New Bedford were analyzed for the two station locations proposed in New Bedford. These stations would serve both the Whittenton and Stoughton Alternatives:

- Whale's Tooth
- King's Highway

Intersections near these station locations were analyzed for the No-Build condition. The access to an expanded park-and-ride facility on Mount Pleasant Street was also analyzed for the No-Build Alternative.

The Whale's Tooth Station would be located east of Route 18 and north of Route 6 near the downtown and the waterfront. The 2030 No-Build traffic volume projections for the Whale's Tooth Station area are shown in Figures 4.1-28 and 4.1-29. Table 4.1-35 provides a comparison of traffic operations between No-Build and Existing Conditions. Under No-Build conditions, there are minor or no changes in LOS projected at the signalized intersections and most of the unsignalized intersections analyzed for the Whale's Tooth station location. One unsignalized location, Purchase Street at Route 18 SB ramp, currently operates at a LOS E during the evening peak hour and is expected to operate at the same LOS E under No-Build conditions. Three unsignalized locations are expected to decline from LOS E to LOS F during one peak hour; these include Coggeshall Street at North Front Street during the morning peak hour and Coggeshall Street at Purchase Street and Purchase Street at Weld Street during the evening peak hour.

Table 4.1-35 New Bedford Intersection Capacity Analysis– 2030 No-Build Conditions vs. Existing Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	No-Build			Existing	No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Whale's Tooth Station								
Hillman St at Purchase St.	B	0.37	13	B	B	0.50	14	B
Mill St at Pleasant St.	F	0.79	>80	F	E	0.89	73	E
Union St. at Rt. 18	E	0.85	66	E	F	>1.00	>80	F
Union St at McArthur Dr.	C	0.43	29	C	D	0.44	41	D
Rt. 18 NB at Coggeshall St.	B	0.50	17	B	B	0.55	18	B
Rt. 18 SB at Coggeshall St.	C	0.86	42	D	C	0.71	27	C
Coggeshall St. at Belleville Ave.	B	0.70	20	B	B	0.71	20	B
King's Highway Station								
King's Hwy. at Rt. 140 NB Ramps	B	0.65	14	B	C	0.90	27	C
Rt. 18 at Wood St	C	0.57	21	C	B	0.68	17	B
Church St. at Nash Rd	B	0.58	18	B	C	0.92	31	C

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	No-Build			Existing	No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Church St. at Tarkiln Hill Rd	B	0.72	18	B	C	0.88	36	D
King's Highway at Stop & Shop driveway	A	0.48	8	A	B	0.69	13	B
King's Highway at Shaw's driveway	A	0.49	6	A	A	0.61	9	A
King's Highway at Mt. Pleasant St.	N/A	0.52	16	B	N/A	>1.00	58	E
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
Whale's Tooth Station								
Hillman St. at McArthur Dr.	B	Hillman EB L/R	11	B	B	Hillman EB L/R	13	B
McArthur Dr. at Herman Melville Blvd.	B	Melville WB L/R	15	B	C	Melville WB L/R	18	C
Coggeshall St. at Purchase St.	C	Purchase SB All	18	C	E	Purchase NB All	>50	F
Coggeshall St. at N. Front St.	E	N. Front NB All	>50	F	F	N. Front NB All	>50	F
Purchase St. at Weld St.	C	Weld WB L	24	C	E	Weld WB L	>50	F
Logan St. at Purchase St.	C	Logan WB L/R	17	C	C	Logan WB L/R	22	C
Logan St. at McArthur Dr.	B	Logan EB All	11	B	B	Logan WB All	12	B
Logan St. at N. Front St.	C	Logan EB All	23	C	C	Logan EB All	21	C
Wamsutta St. at N. Front St.	B	Wamsutta EB L/R	11	B	B	Wamsutta EB All	12	B
	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	No-Build			Existing	No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Wamsutta St. at McArthur Dr.	A	Wamsutta WB L/R	10	A	A	Wamsutta WB L/R	9	A
Purchase St. at Rt. 18 SB Exit Ramp	C	Rt. 18 WB All	26	D	E	Rt. 18 WB All	47	E
King's Highway Station								
Mt. Pleasant St. at Rt. 140 SB Ramps	F	Off-Ramp WB L	>50	F	F	Off-ramp WB L	>50	F
King's Highway at Mt. Pleasant St.	F	N/A	N/A	N/A	F	N/A	N/A	N/A
Church St. at Park Ave.	C	Park WB All	22	C	F	Park WB All	>50	F
Church St. at Irvington St	B	Irvington WB All	15	C	C	Irvington EB All	22	C
King's Highway at Tarkiln Hill Rd.	D	Tarkiln EB L/R	28	D	F	Tarkiln EB L/R	>50	F

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound
Shaded rows reflect over capacity intersections (LOS = F)

The King's Highway Station would be located off King's Highway, east of the Route 140 interchange. The 2030 No-Build traffic volume projections for the King's Highway Station area are shown in Figures 4.1-30 and 4.1-31. With one exception, there are no changes in LOS projected at any of the locations analyzed for the King's Highway station location. The unsignalized intersection of King's Highway at Mount Pleasant Street operates at LOS E and LOS F, during the morning and evening peak hours respectively, under Existing Conditions. Under No-Build conditions, the intersection is expected to be signalized and to operate at LOS B and LOS E, respectively, during the morning peak and evening peak hours.

Freetown—No-Build conditions in Freetown were analyzed for one station location proposed in Freetown. This station would serve the Whittenton, and Stoughton Alternatives. The station would be located on the east side of South Main Street south of Route 24 Exit 9 between the Stop & Shop Distribution Center and the planned entrance to the Riverfront Business Park. The Riverfront Business Park is a proposed 1.7-million square foot commercial development on the west side of South Main Street south of the Stop & Shop Distribution Center.

Under Existing Conditions, the Freetown station study area consists of six unsignalized intersections. Under No-Build conditions, the two unsignalized locations at the Route 24 Exit 9 northbound and southbound ramps are expected to be signalized as mitigation for the Payne's Crossing project. A seventh location at Payne's Crossing driveway, which would also be signalized, has been added to the No-Build analyses. On the west side of South Main Street just south of Route 24 Exit 9, the Payne's Crossing development is proposed to include:

- A 167,000 square foot home-improvement warehouse store
- A 195,000 square foot discount superstore
- 15,000 square feet of other retail space
- 1,530 parking spaces

Proposed traffic mitigation for the Payne's Crossing project includes proposed improvements at Route 24 Exit 9:

- Widening a portion of South Main Street between the Payne's Crossing driveway and the northbound ramps intersection at Exit 9.
- Installing traffic signals at the South Main Street intersections with the Route 24 northbound and southbound ramps.

The 2030 No-Build traffic volume projections for the Freetown Station are shown in Figures 4.1-32 and 4.1-33. Table 4.1-36 provides a comparison of Existing and No-Build traffic operations.

One of the signalized intersections is projected to operate at a deficient LOS under No-Build conditions. South Main Street at the Route 24 northbound ramps is projected to operate at LOS E during the evening peak hour. Under the No-Build Alternative, two of the unsignalized intersections are expected to decline to LOS F during both the morning and evening peak hours. One additional unsignalized intersection is expected to decline to LOS F during the evening peak hour because of the expected increased volume of traffic on South Main Street resulting from already planned projects in the station vicinity.

Table 4.1-36 Freetown Intersection Capacity Analysis– 2030 No-Build Conditions vs. Existing Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	2030-No-Build			Existing	2030-No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS[1]	V/C	Delay	LOS
Freetown Station								
S. Main St. at Rte. 24 SB Ramps	N/A	0.59	7	A	N/A	0.62	10	B
S. Main St. at Rte. 24 NB Ramps	N/A	0.96	33	C	N/A	1.04	60	E
S. Main St. at Payne's Crossing Site Driveway	N/A	0.29	2	A	N/A	0.48	13	B
Executive Park Dr. at S. Main St.	N/A	0.81	19	B	N/A	0.83	41	D
Executive Park Dr. at Rt. 24 SB Off-Ramps	N/A	0.86	30	C	N/A	0.90	25	C
Executive Park Dr. at Rt. 24 NB Off-Ramps	N/A	0.83	15	B	N/A	0.52	8	A
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
Freetown Station								
S. Main St. at High St.	B	High NB All	>50	F	B	High NB All	>50	F
S. Main St. at Ridge Hill Rd.	E	Ridge Hill WB All	>50	F	E	Ridge Hill WB All	>50	F
S. Main St. at Rte. 24 SB Ramps	C	N/A	N/A	N/A	E	N/A	N/A	N/A
S. Main St. at Rte. 24 NB Ramps	E	N/A	N/A	N/A	E	N/A	N/A	N/A
S. Main St. at Narrows Rd.	C	Narrows EB L/R	26	D	C	Narrows EB L/R	>50	F
S. Main St. at Copicut St.	B	Copicut WB L/R	15	B	B	Copicut WB L/R	15	B

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All moves
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Fall River—No-Build conditions in Fall River were analyzed for two proposed station locations. These stations would serve the Whittenton and Stoughton Alternatives:

- Fall River Depot
- Battleship Cove

The existing Fall River traffic volume networks were projected to create the 2030 No-Build condition traffic volume networks, which are depicted in Figures 4.1-34 and 4.1-35. A comparison of Existing and No-Build capacity analysis results for the Fall River station study areas are shown in Table 4.1-37. The Fall River Depot station site is located 1 mile north of downtown Fall River on North Davol Street at Pearce Street. Three signalized and four unsignalized intersections were analyzed for Fall River Depot Station. All are projected to experience no change in LOS from Existing Conditions to No-Build conditions.

Table 4.1-37 Fall River Intersection Capacity Analysis– 2030 No-Build Conditions vs. Existing Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	2030 No-Build			Existing	2030 No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS[1]	V/C	Delay	LOS
Fall River Depot Station								
S. Davol St. at President Ave.	C	0.67	28	C	B	0.62	20	C
N. Davol St. at President Ave.	B	0.51	20	B	B	0.66	20	C
N. Main St. at President Ave.	C	0.79	28	C	C	0.90	38	D
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
Battleship Cove Station								
Ponta Delgada Blvd. at Anawan St.	C	Anawan EB All	15	C	C	Anawan WB All	16	C
Ferry St. at Ponta Delgada	B	Ferry EB L/R	14	B	B	Ferry EB L/R	12	B
Anawan St. at Davol St.	F	Davol SB All	>50	F	F	Davol SB All	>50	F
Central St. at Davol St.	E	Central WB L	>50	F	F	Central WB L	>50	F
Fall River Depot Station								
Turner St. at N. Davol St.	B	Turner R	13	B	B	Turner R	14	B
Pearce St. at N. Davol St.	B	Pearce R	12	B	B	Pearce R	14	B
Davol St. SB to NB U-turn near Cedar St.	B	U-turn SW L	13	B	B	U-turn SW L	12	B
Davol NB to SB U-turn near Cedar St	B	U-turn NE L	14	B	B	U-turn NE L	14	B

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

The proposed Battleship Cove station site would be on Ponta Delgada Boulevard west of Route 138 and south of I-195 and the Fall River Heritage State Park (Battleship Cove). Four unsignalized locations were analyzed for the Battleship Cove Station and all but one are expected to experience no change in LOS. The exception is Central Street at Davol Street where the westbound Central Street approach is projected to decline from LOS E to LOS F.

Taunton—No-Build traffic conditions in Taunton were analyzed for two station locations in the City of Taunton: Taunton Depot and Taunton.

A detailed No-Build traffic assessment was not prepared for the Dana Street Station, but potential impacts were addressed qualitatively through a screening analysis using traffic data for the nearby Downtown Taunton Station analyzed in the DEIS/DEIR and the 2035 Whittenton Electric boarding estimates provided by CTPS. See Section 4.1.4.2 for further information on the methodology and results of the screening analysis for the Dana St. Station.

The Taunton Depot station location is common to both the Stoughton and Whittenton Alternatives. It is accessible from Route 140 west of the Route 24 interchange. The Taunton 2030 No-Build traffic volume projections are shown in Figures 4.1-36 and 4.1-37 (the figures were developed for the DEIS/DEIR and also show the Downtown Taunton Station that has been replaced by the Dana Street Station under the Whittenton Alternatives). Table 4.1-38 presents the traffic operations comparison between Existing and No-Build conditions.

Table 4.1-38 Taunton Intersection Capacity Analysis—2030 No-Build Conditions vs. Existing Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	No-Build			Existing	No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Taunton Depot Station								
Rt. 140 at Hart St.	D	>1.00	70	E	D	>1.00	79	E
Rt. 140 at Rt. 24 SB Ramps	C	0.78	17	B	F	>1.00	61	E
Rt. 140 at Rt. 24 NB Ramps	B	0.90	7	A	A	0.70	3	A
Rt. 140 at Taunton Depot Dr.	B	0.55	14	B	B	0.61	20	B
Rt. 140 at Mozzone Blvd.	A	0.40	2	A	B	0.95	21	C
County St at Silver City Galleria Mall driveway/Rt. 140 Ramps	A	0.09	4	A	A	0.41	8	A
Stevens St. at Rt. 140 NB Ramps	B	0.46	15	B	B	0.58	18	B
Downtown Taunton Station								
Weir St/Broadway at Cohannet St	B	0.61	16	B	B	0.58	16	B
Washington St at Court St	C	0.79	27	C	D	0.88	53	D
Washington St at Tremont St	D	0.79	39	D	D	0.87	48	D
Taunton Station								
Broadway St at Washington St	C	0.75	34	C	D	0.86	47	D
Rt. 44 at Dean St./Rt. 104	A	0.76	9	A	B	0.68	11	B
Rt. 44 at Longmeadow Rd	F	1.00	>80	F	E	>1.00	78	E
Rt. 44 at Arlington St	C	0.97	43	D	D	0.99	53	D
Main St. at Union St.	C	0.92	33	C	C	0.88	30	C
Spring St at Summer St (Rt. 140)	C	0.70	26	C	C	0.80	27	C
Rt. 140 at Hon. Gordon Owen Riverway	B	0.75	16	B	C	0.95	41	D
Taunton Station								
Arlington St at School St	C	School NB All	20	C	D	School NB All	30	D
Washington St at Purchase St	C	Washington SB All	25	C	F	Washington NB All	>50	F
School St at Winter St	F	School SB All	>50	F	F	School SB All	>50	F

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Five of the seven signalized intersections analyzed for this station location are expected to operate at acceptable levels of service during both peak hours under No-Build conditions. One location is expected to operate at acceptable levels of service during the morning peak hour but at LOS E during the evening peak hour, and one location is expected to operate at LOS E during both morning and evening peak hours. Route 140 at the Route 24 southbound ramps is expected to improve from LOS F to LOS E during the evening peak hour because of the planned improvements at that location described earlier. Route 140 at Hart Street will experience an increase in delay that would cause operations to decline slightly and operate at LOS E during both peak hour periods. No unsignalized intersections were analyzed for the Taunton Depot station location.

Under the Stoughton Alternative, the Taunton Station would be located on Arlington Street just north of Route 44 (Dean Street). Six of the seven signalized intersections analyzed for the Taunton station location are expected to operate at acceptable levels of service during both peak hours. The intersection of Route 44 at Longmeadow Road is projected to remain at LOS F during the morning peak hour and LOS E during the evening peak hour under No-Build conditions. LOS at the three unsignalized intersections analyzed is not expected to change from Existing Conditions to No-Build conditions.

Stoughton—The 2030 No-Build condition traffic volumes for the Stoughton Station study area were developed by applying a background growth rate of 5 percent to the existing traffic volumes. Vehicle trips associated with the projected No-Build condition growth in ridership at the station were then added to the base, and the traffic volume networks were developed. The No-Build condition morning and evening peak hour volume networks are depicted in Figure 4.1-38 and Figure 4.1-39.

To assess the change in traffic operations, roadway capacity analyses were conducted for the No-Build condition and compared to the existing conditions. The results of the signalized and unsignalized intersection capacity analyses for each of the study area intersections are summarized in Table 4.1-39 and Table 4.1-40. Complete traffic operations analysis results are provided in Appendix 4.1-K.

Table 4.1-39 Stoughton Station Signalized Intersection Capacity Analysis– No-Build Condition vs. Existing Conditions

		Existing Conditions			No-Build Condition		
Location	Period	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS
Porter Street at Washington Street	Weekday Morning	0.69	21	C	0.73	22	C
	Weekday Evening	0.90	49	D	0.94	60	E
Pleasant Street at Park Street/	Weekday Morning	0.92	36	D	0.96	45	D
Washington Street	Weekday Evening	0.79	24	C	0.83	27	C

Source: Synchro 7 (Build 773, Rev 8) software
1 volume-to-capacity ratio
2 average delay in seconds per vehicle
3 level of service

As shown in Table 4.1-39, there would be no change in level of service for the signalized intersection of Pleasant Street at Park Street/Washington Street under the No-Build condition. The intersection of Porter Street at Washington Street would continue to operate at an acceptable level of service during the morning peak hour but the level of service would decline from LOS D to LOS E during the evening peak hour.

As presented in Table 4.1-40 and Table 4.1-41, all locations operating at poor levels of service under existing conditions will continue to operate poorly in the future. Although a few of the unsignalized

intersections experienced a slight increase in delay under the No-Build condition, none are projected to degrade the level of service.

Table 4.1-40 Stoughton Station Unsignalized Intersection Capacity Analysis (Morning Peak Hour)– No-Build Condition vs. Existing Conditions

Location	Critical Movement	Existing Conditions Dem[1]	v/c[2]	Del[3]	LOS[4]	No-Build Condition Dem	v/c	Del	LOS
Porter Street at Washington Street	WB RT	15	0.07	14	B	15	0.07	15	B
Freeman Street at Washington Street	WB RT	10	0.19	52	F	10	0.22	63	F
Wyman Street at Washington Street	EB RT	125	0.32	16	C	130	0.35	17	C
Morton Street/Trackside Plaza South Drive/MBTA Lot Driveway at Wyman Street	EB LT-TH-RT	290	0.09	3	A	317	0.1	3	A
	WB LT-TH-RT	65	0	1	A	69	0	1	A
	NB LT-TH-RT	Neg	0.01	14	B	Neg	0.01	14	B
	SB LT-TH-RT	10	0.04	11	B	14	0.04	11	B
Summer Street at Wyman Street	EB LT-RT	30	0.04	9	A	33	0.04	9	A
Brock Street at Washington Street	EB LT-TH-RT	120	0.62	40	E	125	0.70	50	E
	WB LT-TH-RT	50	0.32	30	D	50	0.36	34	D
	NB LT-TH-RT	410	0.14	4	A	435	0.15	4	A
	SB LT-TH-RT	345	0	0	A	365	0	0	A
Brock Street at Morton Street	EB LT-TH-RT	60	0.10	9	A	65	0.12	9	A
	WB LT-TH-RT	205	0.37	11	B	215	0.40	11	B
	NB LT-TH-RT	220	0.42	11	B	237	0.46	12	B
	SB LT-TH-RT	75	0.16	9	A	82	0.17	10	A
Brock Street at Wyman Street	WB LT-RT	95	0.13	9	A	100	0.14	10	A
Park Avenue/Sumner Street at Park Street	EB LT	205	>1.20	>120	F	215	>1.20	>120	F
	EB TH-RT	15	0.05	16	C	15	0.06	17	C
	WB LT-TH-RT	20	0.09	21	C	20	0.10	22	C

Source: Synchro 7 (Build 773, Rev 8) software
Note: Shaded cells denote LOS E/F conditions.
1 demand in vehicles per hour for unsignalized intersections
2 volume-to-capacity ratio for the critical movement, values over 1.0 indicate demand in excess of capacity.
3 Control delay per vehicle, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
4 level of service of the critical movement
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = left-turn; TH = through; RT = right-turn
Neg = negligible

Table 4.1-41 Stoughton Station Unsignalized Intersection Capacity Analysis (Evening Peak Hour)– No-Build Condition vs. Existing Conditions

Location	Critical Movement	Existing Conditions Dem[1]	v/c[2]	Del[3]	LOS[4]	No-Build Condition Dem	v/c	Del	LOS
Porter Street at Washington Street	WB RT	25	0.08	12	B	25	0.08	13	B
Freeman Street at Washington Street	WB RT	15	0.12	29	D	15	0.14	32	D
Wyman Street at Washington Street	EB RT	125	0.42	22	C	140	0.50	26	D
Morton Street/Trackside Plaza South Drive/MBTA Lot Driveway at Wyman Street	EB LT-TH-RT	130	0.02	1	A	143	0.02	1	A
	WB LT-TH-RT	140	0	1	A	150	0	1	A
	NB LT-TH-RT	5	0.04	14	B	5	0.04	14	B
	SB LT-TH-RT	30	0.07	10	B	33	0.08	11	B
Summer Street at Wyman Street	EB LT-RT	65	0.07	9	A	70	0.08	9	A
Brock Street at Washington Street	EB LT-TH-RT	145	1.13	>120	F	155	>1.20	>120	F
	WB LT-TH-RT	70	1.08	>120	F	70	>1.20	>120	F
	NB LT-TH-RT	465	0.09	3	A	490	0.10	3	A
	SB LT-TH-RT	775	0.01	1	A	820	0.01	0	A
Brock Street at Morton Street	EB LT-TH-RT	75	0.12	9	A	80	0.13	9	A
	WB LT-TH-RT	165	0.30	10	A	170	0.31	10	B
	NB LT-TH-RT	90	0.18	9	A	97	0.19	9	A
	SB LT-TH-RT	155	0.30	10	B	165	0.32	10	B
Brock Street at Wyman Street	WB LT-RT	115	0.15	9	A	120	0.16	9	A
Park Avenue/Sumner Street at Park Street	EB LT	120	1.05	>120	F	125	>1.20	>120	F
	EB TH-RT	25	0.10	18	C	25	0.11	19	C
	WB LT-TH-RT	50	0.26	23	C	50	0.28	25	D

Source: Synchro 7 (Build 773, Rev 8) software
Note: Shaded cells denote LOS E/F conditions.
1 demand in vehicles per hour for unsignalized intersections
2 volume-to-capacity ratio for the critical movement, values over 1.0 indicate demand in excess of capacity.
3 Control delay per vehicle, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
4 level of service of the critical movement
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = left-turn; TH = through; RT = right-turn
Neg = negligible

Easton—Traffic operations analyses under No-Build conditions were conducted at intersections near two proposed station locations in Easton:

- North Easton
- Easton Village

The North Easton station would be located west of Route 138 on the Easton-Stoughton town line. The Easton 2030 No-Build traffic volume projections are shown in Figures 4.1-40 and 4.1-41. As shown in Table 4.1-42, two signalized and two unsignalized intersections were analyzed and only one location is expected to change in LOS, from acceptable LOS D to LOS F under No-Build conditions. The two unsignalized locations are projected to continue operating at LOS F during both peak hours and the signalized intersection of Route 138 is projected to continue to operate at LOS F during the morning peak hour.

Table 4.1-42 Easton Intersection Capacity Analysis - 2030 No-Build Conditions vs. Existing Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	No-Build			Existing	No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
North Easton Station								
Rt. 138 at Roche Bros. Way	B	0.75	13	B	B	0.62	15	B
Rt. 138 at Main St.	F	0.96	>80	F	D	>1.00	57	E
Easton Village Station								
Rt. 138 at Belmont St. (Rt. 123)	B	0.86	53	D	D	94	>80	F
Rt. 138 at Roosevelt Circle	N/A	0.61	6	A	N/A	0.79	18	B
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
North Easton Station								
Rte. 138 at Elm St.	F	Elm EB All	>50	F	F	Elm WB All	>50	F
Rte. 138 at Union St.	F	Union WB L/R	>50	F	F	Union WB L/R	>50	F
Easton Village Station								
Elm St. at Main St	B	Elm WB L/R	13	B	B	Elm WB L/R	15	B
Center St. at Main St. at Lincoln St.	F	Center NB All	>50	F	F	Center NB All	>50	F
Lincoln St. at Barrows St.	B	Barrows NB All	11	B	C	Barrows NB All	26	D
Rt. 138 at Roosevelt Circle	E	N/A	N/A	N/A	C	N/A	N/A	N/A

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Raynham—The Raynham Park station site would be located on the west side of Route 138 just south of the former Raynham-Taunton Greyhound Park, now the Raynham Park Simulcast Center. Traffic operations at three signalized and six unsignalized intersections were analyzed for Existing Conditions. The Raynham 2030 No-Build traffic volume projections are shown in Figures 4.1-42 and 4.1-43. As shown in Table 4.1-43 and described earlier, under No-Build conditions three of the unsignalized

intersections along Route 138 are expected to be signalized, including the northbound and southbound I-495 ramps, and Center Street. All three of these intersections operate at LOS F as unsignalized intersections but are expected to operate at LOS C or better under signalization. The original three signalized intersections are expected to continue operating at acceptable levels of service. Both unsignalized Britton Street intersections with Route 138 are projected to operate at LOS F and the Wilbur Street intersection with Route 138 is expected to decline from LOS D to LOS E during both peak hours under No-Build conditions. The Raynham Park driveway is projected to decline from LOS E to LOS F during both peak hours.

Table 4.1-43 Raynham Intersection Capacity Analysis– 2030 No-Build Conditions vs. Existing Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Existing	No-Build			Existing	No-Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Raynham Park Station								
Rt. 138 at Rt. 106 (Foundry St., Easton)	B	0.88	23	C	C	>1.00	43	D
Rt. 138 at Elm St.	C	0.74	16	B	B	0.71	16	B
Rt. 138 at I-495 NB Ramps	N/A	0.68	16	B	N/A	0.82	18	B
Rt. 138 at I-495 SB Ramps	N/A	0.93	25	C	N/A	0.69	14	B
Rt. 138 at Carver St.	B	0.86	21	C	B	>1.00	42	D
Rt. 138 at Center St.	N/A	0.57	7	A	N/A	0.94	22	C
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
Raynham Park Station								
Rt. 138 at Wilbur St.	D	Wilbur L/R	39	E	D	Wilbur L/R	36	E
Rt. 138 at I-495 NB Ramps	F	N/A	N/A	N/A	F	N/A	N/A	N/A
Rt. 138 at I-495 SB Ramps	F	N/A	N/A	N/A	F	N/A	N/A	N/A
Rt. 138 at Center St.	F	N/A	N/A	N/A	F	N/A	N/A	N/A
Rt. 138 at Britton St. (East)	F	Britton WB L/R	>50	F	F	Britton WB L/R	>50	F
Rt. 138 at Britton St. (West)	E	Britton EB L/R	>50	F	F	Britton EB L/R	>50	F
Rt. 138 at Robinson St.	D	Robinson WB L/R	31	D	B	Robinson WB L/R	14	B
Rt. 138 at Dog Track Driveway	C	Driveway EB All	30	D	D	Driveway EB All	45	E

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

4.1.4.2 Build Alternatives

Regional Transportation Impacts

This section evaluates the impact on regional transportation with regard to the four key criteria identified in Section 4.1.2 and as utilized in preceding alternatives analyses with regard to achieving the project purpose. They include positive and negative impacts on the ability of the transportation system

to meet projected ridership demand, the impact of an alternative on the quality of service of the transportation system as expressed in transit travel time, adherence to MBTA service delivery policy and reliability of the transportation system, impact on VMT and the impact of an alternative on regional mobility (i.e. the connectivity among transportation services). Ridership projections were developed by CTPS based on established methodologies for transportation projects. Documentation of the ridership modeling methodology is provided in Appendix 3.2-G and 3.2-H.

Ridership Demand

To conservatively determine the effects of the Build Alternatives on the regional highway network, the transit ridership projections for the No-Build (Enhanced Bus) Alternative and the Build Alternatives were modeled and compared. The No-Build ridership projections reflect the Enhanced Bus boardings and alightings. The Build Alternative ridership projections reflected both boardings and alightings for the existing regional bus and proposed commuter rail services. To determine the benefit (Build vs. No-Build), the No-Build Enhanced Bus Alternative ridership was subtracted from the Build Alternative ridership to determine the amount of additional transit ridership that the Build Alternatives are projected to attract. All boarding and alighting projections were calculated for three-hour morning and evening peak periods.

Ridership demand was evaluated to determine how well an alternative would be able to meet existing and future demand for public transportation between Fall River/New Bedford and Boston. In order to estimate overall transit demand for the region, an optimal transit system with no constraints such as construction costs or environmental impacts would have to be simulated. While this optimal transit demand has not been quantified, demand was measured in terms of the number of daily work-related trips between South Coast communities and Boston. For this screening analysis, transit demand was based on 2000 Journey-to-Work (JTW) data.

Total service to the South Coast region was considered the total station boardings as projected for each alternative in addition to boardings at existing commuter bus services, which is anticipated to continue to operate with the South Coast Rail project in place. According to the JTW data, the number of daily work trips from the South Coast region to Boston is approximately 8,000. The ability of the alternative to meet possible future ridership potential was calculated as the percent of met ridership demand.

As shown in Table 4.1-44, the rail alternatives would result in 3,930 to 4,570 daily boardings at the new stations. Private bus service boardings would decline substantially to 1,100 to 1,350 (compared to 6,000 in the 2035 No-Build condition) as a result of the diversion of passengers to the new rail option. When the rail ridership and remaining bus ridership are considered together, the alternatives meet 65.5 to 71.0 percent of the demand for approximately 8,000 work trips from the South Coast region to Boston.

Due to a faster travel time to Boston, the Stoughton Alternatives achieve greater ridership in the Southern Triangle than the Whittenton Alternatives. For example, the Stoughton Electric would have 840 daily boardings at Fall River Depot compared to 750 under the Whittenton Electric Alternative. The Whittenton Alternatives ridership is also less than the Stoughton Alternatives because the Whittenton alignment does not include the Taunton Station, which has 670 daily boardings under the Stoughton Electric Alternative. The Whittenton Alternative station closest to downtown Taunton (Dana Street) has substantially lower ridership (320 daily boardings under the electric alternative). The Whittenton Electric Alternative boardings at Raynham Park (520) would be higher than under the Stoughton Electric (430), because in the absence of Taunton Station, some riders would proceed to Raynham Park rather than Dana Street.

Table4.1-44 Daily Ridership Demand by Alternative (2035)

Name	New Station Boardings*	Boardings at Existing Commuter Bus Services	Total Service to South Coast Region	Percentage of Met Ridership Demand[1]
Stoughton Electric Alternative	4,570	1,100	5,670	70.9%
Stoughton Diesel Alternative	4,430	1,250	5,680	71.0%
Whittenton Electric Alternative	4,040	1,200	5,240	65.5%
Whittenton Diesel Alternative	3,930	1,350	5,280	66.0%

1 Total Service to South Coast region divided by the number of daily work trips from the South Coast region to Boston (approximately 8,000)
* Relocated Stoughton Station not considered "new"

The difference in ridership between the electric and diesel versions of the alternatives is small, with the diesel alternative rail ridership at new stations being approximately three percent lower than the corresponding electric alternative due to slightly longer travel times. Despite having lower rail ridership, the Stoughton Diesel Alternative has the highest total service to the South Coast Region when considered together bus service (although the difference from the electric version is negligible—10 boardings).

Quality of Service

The following two sections evaluate how well each alternative provides a transit service. It focuses on two factors: travel time and reliability. Travel time measures how quickly an alternative would be able to get a passenger from the South Coast region into Boston and reliability measures how often that service would be on time and, therefore, how dependable the service would be to the passengers who ride it. An alternative that does not improve the quality of transit services over the existing services provided in the region provides no functional benefit to the communities. Quality of service is assessed based on commuting time, reliability, comfort, convenience and safety. For the purposes using quantifiable criteria, only run time and reliability are used as subcriteria.

Travel Time—Since New Bedford/Fall River commuters currently rely on cars and private bus services, an improved quality of service would have to provide a comparable or competitive *travel time* and improved *reliability* with respect to existing commuter options during peak commuting periods. The average commuting time by car during rush hour in 2009 was 90 minutes and travel time by car is projected by CTPS to deteriorate further to 100-120 minutes under the No-Build scenario. There would be no measurable change in travel time by car under the Build Alternatives because due to the saturated nature of the corridor, any trips that shift to rail with the Build Alternatives would be replaced and would result in no change to travel time by car. Travel time for the rail alternatives was based on rail operations analysis,[12] which identified the segments of the rail corridors that would operate at top speed as well as segments where speed is constrained due to speed restrictions, geometry, vehicles, power mode, dwell times and number of stations and civil restrictions. Each commuter rail alternative has two overall run times: one for electric locomotives and one diesel locomotives. The primary factor

[12] Capacity Utilization Analyses Technical Memorandum, Systra USA, November 17, 2008.

differentiating the travel time performance of the electric vs. diesel option is the greater acceleration time for diesel trains.

Table 4.1-45 summarizes travel time provided by each alternative and shows the reduction in travel time compared to the 2035 No-Build travel time by automobile in the peak period.

Table 4.1-45 Average Travel Times by Alternative (New Bedford to South Station Peak Period)

Name	Rail Travel Time (min)	Change from 2035 Auto Travel Time (100 minutes)
Stoughton Electric Alternative	77	-23
Stoughton Diesel Alternative	82	-18
Whittenton Electric Alternative	84	-16
Whittenton Diesel Alternative	89	-11

The Stoughton Electric Alternative achieves the fastest travel times (77 minutes between New Bedford and Boston during the peak period). The Stoughton Diesel Alternative takes approximately 5 minutes longer than the electric alternative to travel the same route because of the additional time diesel locomotives need to accelerate from the stations and the lower maximum speed of the diesel trains.

The longer route, and the lower speed needed to maintain safety on the sharp curves in Taunton under the Whittenton Electric Alternative, results in a total travel time approximately seven minutes longer than the Stoughton Electric Alternative (84 minutes compared to 77 minutes). The Whittenton Diesel Alternative takes 5 minutes longer to travel from New Bedford to Boston than the Whittenton Electric Alternative and has the longest travel time of the rail alternatives.

Service Delivery Policy

While an alternative might offer many benefits for the transit system in the South Coast region, it may be an unattractive service for the communities it is designed to serve because it offers too few trips. In order to maintain acceptable service, the MBTA has established a Service Delivery Policy[13] to ensure it provides quality transit services that meet the needs of the riding public. The minimum frequency of service levels provides the guidelines by which the MBTA maintains accessibility to the transportation network within a reasonable waiting period. The minimum frequency of service standards is the minimum frequency that must be maintained in a service. Commuter Rail minimum frequencies should provide 3 trips in a peak direction during the AM and PM peak periods.[14]

The Stoughton and Whittenton Alternatives (electric and diesel variants) would all meet the minimum service delivery policy standard.

Vehicle Miles Traveled

VMT is an important gauge for an alternative’s transportation system benefits. VMT measures the extent of motor vehicle operation or the total number of vehicle miles traveled within the study area on given day. This particular measure quantifies how many miles of travel would be removed from the regional roadway network by commuters who elect to travel by train or bus rather than drive. This

[13] Massachusetts Bay Transportation Authority, *Service Delivery Policy*, MBTA Board of Directors approved January 14, 2009.
[14] Between LIRR, MNRR, MBTA, and METRA, the average service provided is 2.9 peak period trains.

reduction in driving has several environmental benefits, notably, cleaner air and a reduction in greenhouse gas emissions. Fewer cars on the road also ease congestion along highway corridors. The alternative with the greatest VMT change (reduction) receives the highest score under this criterion.

Table 4.1-46 summarizes the daily reduction in VMT provided by each alternative based on updated CTPS projections for 2035 and how the alternatives score against each other with regard to meeting the project purpose to reduce VMT.

Table 4.1-46 Regional VMT Reductions by Alternative (2035, Auto and Bus Transit)

Name	VMT Reduction (daily miles)
Stoughton Electric Alternative	(-255,932)
Stoughton Diesel Alternative	(-240,348)
Whittenton Electric Alternative	(-201,232)
Whittenton Diesel Alternative	(-186,306)

The Stoughton Electric Alternative achieves the greatest reduction in daily VMT of all the alternatives, approximately 54,700 VMT per day greater than the Whittenton Electric Alternative. The Stoughton Diesel Alternative has the second greatest VMT reduction, approximately 6.1 percent less than the Stoughton Electric Alternative. With the longest travel time and lowest ridership, the Whittenton Diesel Alternative is also the least effective of the rail alternatives in reducing regional VMT, although it still provides substantial benefits (reduction of 186,306 VMT per day).

Regional Mobility

The following sections discuss the number of interregional links provided by each alternative as an indication of how well each alternative meets the project purpose to improve regional mobility. As all the alternatives provide a connection from Fall River and New Bedford to Boston, an alternative will be considered more favorable if it also enhances mobility between points within the region. An interregional link is a link that provides a one-seat ride from one municipality to another. Connections within a municipality were not counted. For instance, New Bedford, which would accommodate two stations, would provide a one-seat ride from Whale's Tooth to King's Highway. However, this connection was not considered an improvement to regional mobility as it is contained within New Bedford.

The Stoughton and Whittenton Alternatives are equivalent in terms of meeting the regional mobility project purpose—both alternatives provide 41 interregional links.

Table 4.1-47 highlights the interregional links provided by the Stoughton and Whittenton Alternatives.

Table 4.1-47 Interregional Links–Stoughton and Whittenton Alternatives[1]

	Boston	Westwood	Canton	Stoughton	Easton	Raynham	Taunton	Freetown	Fall River	New Bedford
Boston		X	X	X	X	X	X	X	X	X
Westwood	X		X	X	X	X	X	X	X	X
Canton	X	X		X	X	X	X	X	X	X
Stoughton	X	X	X		X	X	X	X	X	X
Easton	X	X	X	X		X	X	X	X	X
Raynham	X	X	X	X	X		X	X	X	X
Taunton	X	X	X	X	X	X		X	X	X
Freetown	X	X	X	X	X	X	X		X	
Fall River	X	X	X	X	X	X	X	X		
New Bedford	X	X	X	X	X	X	X			

1 Inter-municipal connections not included.

Impacts to Freight Operations

An improved infrastructure would improve the future of freight operations in the South Coast region. The current lines operate at a class 3 or higher, only allowing for very slow speed operations. With the infrastructure improvements that will come as part of the South Coast Rail passenger service the growth of freight operations could certainly occur if properly planned.

By far the most difficult part of future freight operations will occur in and around Weir Junction. The Massachusetts Coastal Railroad (Mass Coastal) handles this labor intensive switching in this area and has noted that this is practically a full time (5 days per week) operation, which could grow even more successful with more infrastructure improvements. In addition the track geometry here only allows for slow speed operations. The current and even future proposed freight operation splits the proposed main line (under the Stoughton Alternative). This is because two of the current three Mass Coastal customers are on the east side of the proposed main line, while the third and largest of their shippers is on the west side. This sets up conflicts between operating passenger trains and freight trains during the same period of time.

The need to somehow segregate freight and passenger operations will be critical to the success of both. Under the original design work completed in 2001 new infrastructure was proposed for this area. It consisted of new infrastructure in the Taunton area that would support freight interchanges and "run-arounds"[15] on dedicated freight tracks between Cotley and Weir Junctions. This includes an interchange track at Weir Junction, a diamond crossing to access the New England Refrigerated along with freight set-off/run-around tracks located between Hart Street and Cotley Junction. The main line freight track (currently known as the Attleboro Secondary) will exist adjacent to the MBTA main line between Weir Junction and Hart Street, continuing on to Cotley Junction and Middleborough secondary or continue down to New Bedford/Fall River at Myricks Junction.

[15] A run-round loop (or run-around loop) is a track arrangement that enables a locomotive to attach to the opposite end of the train. This process is known as "running round a train". It is commonly performed to haul wagons onto a siding, or at a terminal station to prepare for a return journey

The MBTA's proposed passenger train operation will use two tracks from a point just south of Hart Street, through and including Cotley Junction. Freight trains will operate on a dedicated freight track to the west side of the passenger tracks. Freight trains wishing to gain access onto the Middleborough Secondary will wait just north of Cotley Junction for clear operating windows to cross the proposed passenger tracks. Freight trains wishing to head south to either New Bedford or Fall River will also wait here until any passenger trains in these sections have cleared. It should be noted that while the third track's primary purpose is to store/hold freight trains, it will be designed and constructed to support passenger trains so as to maintain operational flexibility.

Cotley Junction is configured to support the direct movement of trains between Middleborough and Attleboro. A freight train coming from either Fall River or New Bedford will need to access the freight track at Cotley Junction before moving on to either Attleboro or Middleborough. This should not present a problem for the freight operations as shuttle type service makes sense from both of these points. However, it must be noted that interchanges between New Bedford and Fall River with the Middleborough line must occur via a reverse direction movement at Taunton. These maneuvers will predominantly depend upon the Cotley Freight Runaround track. It should be noted that the Cotley Freight Runaround should not be used to set off (store) freight cars or freight operations will be severely impacted.

Possible Benefits of the Future Infrastructure

Future local freight switching operations from or via Taunton must support service to three potential territories:

- the Stoughton line;
- Taunton area customers; and
- the New Bedford and Fall River branches.

Freight service to New Bedford and Fall River may operate one of three different ways:

- from Framingham or Readville via Attleboro and Cotley Junction proceeding directly to New Bedford or Fall River;
- from Middleborough, making a run-around move via the proposed Cotley Freight Runaround and then proceeding to New Bedford or Fall River; or
- via Canton Junction, proceeding directly via Taunton to New Bedford or Fall River.

Presently, the only access to the remaining active freight rail customers on the existing Stoughton Branch is via the Northeast Corridor through Canton Junction. The MBTA may or may not grant a freight carrier access to the Canton area through the proposed reconstructed line between Longmeadow Road, Taunton, and the present location of end-of-track in Stoughton. Then railcars consigned to or released by customers located on the line between Taunton and Stoughton could be set-off/switched on the proposed Interchange Track at Weir Junction. Then they would be forwarded via either Middleborough or Attleboro, thence to Beacon Park Yard or Framingham.

Daytime rail freight service on the line segment between Longmeadow Road, Taunton and Stoughton is possible, but not practical. The density of proposed passenger rail service indicates that adequate "windows" for daytime freight operations exist. However, more opportunities exist due to the future track infrastructure. These include the short sidings at Longmeadow Road, Raynham, and the longer siding at North Easton.

Nighttime will provide the freight carriers the best opportunity to complete their rail operations daily. The existing MBTA operations begin at 5:38 AM when the first westbound equipment move reaches Canton Junction from Boston and end at midnight. Proposed layover terminals at Freetown and New Bedford will eliminate these early morning and late night MBTA train movements thereby further increasing the window of opportunity for freight service.

Taunton area customers, including the Rand McNally plant and Mass Coastal's existing customers located on the portion of the New Bedford Line known as the Dean Street Industrial Track, could be served by a switcher based at Taunton. This switcher would also perform the interchange with a line-haul train at Taunton.

Freight service on the New Bedford and the Fall River branches south of Myricks Junction could be a daytime operation. Mid-day MBTA service frequency to each branch is on a 120-minute interval as proposed. This is enough time for a freight train to operate between Fall River and Freetown or Myricks on the Fall River branch. If required the train could pull into one of the proposed Controlled Passing Sidings to clear the main track for an MBTA passenger train. Likewise, this is true for a freight train to operate between Myricks and the Watuppa Branch junction point located just north of New Bedford. On the New Bedford route, since the freight operation is uniquely separated from the freight service operations between Myricks and New Bedford can occur at any time.

The potential of the rail alternatives for impacts to freight operations was investigated by exploring various operating scenarios, as described below.

- A line-haul train originates at Framingham, Massachusetts on the existing CSX Boston Line (and MBTA's Worcester Line route). The train would operate to Attleboro via Mansfield, reverse at Attleboro and proceed to Middleborough via Cotley Junction, stopping in Taunton as necessary to pick up and set-out cars for the Mass Coastal Railroad at Weir Junction. The train would deliver the rest of its cars to Middleborough. Since this train needs access from the Northeast Corridor the train must operate at night between Mansfield and Attleboro.

- A switcher and crew would be called at Middleborough every weekday morning as demand dictated and would operate to Taunton, serving any local customers en route. The train would include cars for either the New Bedford line or the Fall River branch. The train would reverse at Taunton using the Cotley Freight Runaround. When MBTA traffic permits, it would proceed to the New Bedford line or to the Fall River Branch via Myricks Junction.

- All cars collected by the trains operating as per (2) above and cars being collected by the Mass Coastal Railroad along the Middleborough main line would be brought back to an expanded Middleborough yard to be re-assembled into a nighttime line-haul train. This train could then proceed through to Framingham (or perhaps to Beacon Park Yard via the Middleborough/Braintree and the South Station Wye.

- A nighttime Mass Coastal Railroad switch engine and crew would locally deliver the cars left on the Weir Junction Interchange Track by the line-haul train as described at Step (1) above, and return all outgoing cars to the interchange track for pickup. This switch engine might, or might not, have rights to operate as far north at Stoughton. This would depend upon whether this access is negotiated with, and granted by, the MBTA and CSX.

Assuming adequate capacity of the Weir Junction Interchange Track, none of the operational changes would require storage of freight cars on the proposed Cotley Freight Runaround. Should additional capacity be needed beyond that provided by the Weir Junction Interchange Track, the excess cars could be placed on the Runaround Track for collection by the line-haul train the same night. Any daytime switching operations in Taunton would be limited to run-around moves at the Cotley Runaround Track and potentially switching the Rand McNally plant located adjacent to Route 140 near Cotley Junction. Freight customers requiring service at Taunton but lacking a private industrial siding would take deliveries at one of the existing lngell Street spurs.

As described above, feasible scenarios could be developed that would enable co-existence of freight operations and the rail alternatives without impacting freight operations. While during the construction process of the proposed rail alternatives, freight operations would be temporarily impacted, the operation of the rail alternatives would not interfere with freight operations. The permanent long-term infrastructure improvements to the rail network associated with the rail alternatives would also benefit freight operations.

Traffic Operations Analysis

Regional Freeway Benefits

As discussed in Section 4.1.2.3, regional freeway benefits were conservatively assessed based on ridership for the Rapid Bus Alternative. The regional freeway benefits of the Stoughton and Whittenton Alternatives would be greater than the results discussed below.

As shown in **Table** 4.1-48, the four freeway segments analyzed on Route 24 between I-495 and I-93/Route 128 would see an improvement in LOS in the Build condition. During the morning peak hour all four segments would see LOS in the peak northbound direction improves from LOS E to LOS D. The two segments of Route 24 south of I-93 and south of Pond Street would experience similar improvement in the southbound direction in the evening peak hour. Because of these changes, all Route 24 freeway segments from I-495 to I-93 in the Build condition will operate at LOS D or better. There would also be improvements on I-93. I-93 south of Furnace Brook Parkway would also improve in the northbound direction in the morning peak hour from LOS F to LOS E. The two segments of I-93 south of Furnace Brook Parkway and south of Route 3 would improve from LOS E to LOS D. Under the Build condition, the two segments of Route 140 that were analyzed would continue to operate at LOS C or better.

Table 4.1-48 Freeway Capacity Analyses Summary, 2030

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	No-Build	Build (Rapid Bus)			No-Build	Build (Rapid Bus)		
Location/Movement	LOS[1]	Volume[2]	Density[3]	LOS	LOS	Volume	Density	LOS
I-93, south of Furnace Brook Pkwy.								
Northbound Travel Lane	F	7816	38.5	E	C	5361	24.8	C
Southbound Travel Lane	C	5156	23.8	C	E	7207	33.1	D
I-93, south of Route 3								
Northbound Travel Lane	D	5701	23.7	C	C	4791	19.5	C
Southbound Travel Lane	D	7096	30.0	D	E	7342	31.5	D
Route 24, south of I-93/128								
Northbound Travel Lane	E	4756	31.1	D	B	2786	23.5	C
Southbound Travel Lane	C	3456	30.4	D	F	5937	34.4	D
Route 24, south of Pond Street								
Northbound Travel Lane	E	5041	27.3	D	B	3356	26.3	D
Southbound Travel Lane	B	3116	25.2	C	E	5822	33.1	D
Route 24, north of Route 123								
Northbound Travel Lane	E	5106	28.3	D	C	3346	27.5	D
Southbound Travel Lane	B	2446	19.3	C	D	5207	26.9	D
Route 24, north of I-495								
Northbound Travel Lane	E	4988	27.2	D	C	3635	19.7	C
Southbound Travel Lane	B	2847	16.3	B	D	4484	24.9	C
Route 24, north of Route 44								
Northbound Travel Lane	D	4183	21.5	C	C	3620	19.2	C
Southbound Travel Lane	B	3267	17.2	B	D	4199	21.8	C
Route 24, north of Route 140								
Northbound Travel Lane	D	4387	22.5	C	C	3692	19.6	C
Southbound Travel Lane	C	3485	18.2	C	D	4639	24.1	C
Route 24, south of Route 140								
Northbound Travel Lane	D	3509	31.9	D	E	3535	35.1	E
Southbound Travel Lane	D	3267	30.4	D	E	3660	35.3	E
Route 24, north of Exit 9								
Northbound Travel Lane	B	2449	13.4	B	E	3645	37.4	E
Southbound Travel Lane	D	3442	32.6	D	D	3140	28.6	D
Route 24, south of Exit 8 ½								
Northbound Travel Lane	F	4846	>45	F	C	2573	21.5	C
Southbound Travel Lane	C	2728	24.5	C	F	5496	>45	F
Route 140, south of Route 24								
Eastbound Travel Lane	B	1289	11.2	B	B	1616	13.2	B
Westbound Travel Lane	B	1400	11.6	B	B	1540	12.9	B
Route 140, north of Hathaway Road								
Northbound Travel Lane	C	1715	13.8	B	C	2340	18.7	C
Southbound Travel Lane	C	2434	21.7	C	C	2011	17.4	B

1 Level of service
2 Vehicles per hour
3 Passenger cars/per hour/per lane

Traffic Impacts Associated with Grade Crossings

This section provides an evaluation of the transportation impacts associated with the public grade crossings that would be in service along the South Coast Rail project alternatives. Figures 4.1-44 through 4.1-53 present all of the crossing locations for each rail corridor with each crossing's recommended treatment (grade separation, closure, or at-grade crossing). The figures also show the grade crossings in relation to primary emergency vehicle routes, emergency response service providers, and schools. A preliminary assessment of the rail corridors identified 52 existing active public grade crossings. Along the Fall River Secondary (common to all alternatives), four public crossings would be recommended for closure. The Stoughton Alternative would result in 43 active public grade crossings, and the Whittenton Alternative would result in 50 active public grade crossings. Transportation impacts at the proposed public grade crossings were assessed. Based on the traffic and safety analysis conducted, it is recommended that each location would be suitable for public use equipped with a combination of new, state of the art, Automatic Highway Crossing Warning (AHCW) systems and minor geometric modifications such as driveway reconfiguration, driveway closures, vegetation clearing and utility pole relocations. The delay and queue technical analysis for all locations can be found in Appendix 4.1-J.

Southern Triangle Grade Crossings Impacts (Common To All Rail Alternatives)

The majority of grade crossings in the Southern Triangle are projected to be closed only three to four times an hour, or approximately five to seven percent of the peak hour as a result of the introduction of commuter rail service. The Taunton grade crossings would be closed six times an hour, or ten percent of the peak hour. A description is provided below of the effects on traffic conditions at grade crossings in the Southern Triangle resulting from all rail alternatives.

New Bedford Grade Crossings (3) (all Rail Alternatives)—Three grade crossings in New Bedford currently carry active freight traffic and would be upgraded to accommodate the proposed commuter rail service.

- **Samuel Barnet Boulevard**. Samuel Barnet Boulevard serves mainly industrial park-related traffic and the minor queuing anticipated would not affect the traffic operations of these driveways.

Table 4.1-49 shows the traffic volumes and average delay expected along Tarkiln Road and Nash Road where more substantial queuing impacts may occur. An overview of the conditions at both roads is provided below.

Table 4.1-49 New Bedford Grade Crossings–Traffic Volumes[1] and Average Delay (All Rail Alternatives)

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Tarkiln Hill Road	34,000	815	1285	550	51
Nash Road	14,900	510	745	325	42

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Tarkiln Hill Road**. On Tarkiln Hill Road, a calculated queue length of 550 feet and average delays of 51 seconds are projected during peak periods. Existing vehicle queues on the Tarkiln Hill Road eastbound approach to Church Street extend over the grade crossing and beyond the intersection of King's Highway at Stop & Shop. The existing vehicle queues currently impact traffic at two unsignalized intersections (Tarkiln Hill Road at King's Highway and Tarkiln Hill Road at Worcester Street/Park Avenue) as well. Grade separation was considered at this location but cannot be achieved due to both horizontal and vertical curvature constraints and the crossing's proximity to the proposed King's Highway Station platform. Tarkiln Hill Road is proposed to be closed north of its intersection with King's Highway. Traffic along Tarkiln Hill Road would be rerouted through the Stop & Shop driveway intersection. As part of the proposed project, traffic signal preemption is recommended at the intersections of King's Highway and Stop & Shop driveway and Tarkiln Hill Road at Church Street to clear vehicle queuing that extends over the tracks when a train is approaching. Since queues from the adjacent intersections are projected to extend to or over the track location, the need for pre-signals at this grade-crossing, to prevent vehicles from queuing back to the grade crossing during the pre-emption period, will be evaluated as part of the preliminary design phase of the project.

- **Nash Road**. On Nash Road, a calculated queue length of 325 feet and average delays of 42 seconds are projected during peak periods. Existing vehicle queues on the Nash Road westbound approach to Church Street back up over the grade crossing. The vehicle queues could affect traffic at the unsignalized intersection of Nash Road and King Street and at driveways within 325 feet of the crossing. As part of the proposed project, traffic signal preemption is recommended at the intersection of Nash Road and Church Street to clear vehicle queues that extend over the tracks when a train is approaching. Since projected queues from the adjacent intersections are projected to extend to or over the track location, the need for pre-signals at the Nash Road eastbound approach to the grade-crossing will be evaluated as part of the preliminary design phase of the project.

Fall River Grade Crossings (None)—There are no at-grade crossings in Fall River. All major grade crossings within Fall River are grade-separated and all remaining private roadways crossings are expected to be closed.

Freetown Grade Crossings (11) (All Rail Alternatives)—Eleven existing public grade crossings in Freetown currently carry active freight traffic and would be upgraded to accommodate the proposed commuter rail trains. Seven of these crossings are expected to cause minor delays and have little impact on the surrounding roadways.

- **Chace Road**. On Chace Road, the maximum queue lengths and average delays are expected to be minimal. The sand and gravel operation driveway and the residential driveway could be affected by the vehicle queues at the crossing; however, delays are expected to be minimal. The existing driveway on the west side of the crossing may need to be reconfigured or closed.

- **Braley Road**. The maximum queue lengths and average delays at Braley Road are expected to be minimal. The driveway located about 75 feet west of the tracks on the north side of the road is expected to be affected by vehicles queued at the crossing; however, delays would be minimal. On East Chipaway Road, the maximum queue lengths and average delays are expected to be moderate. The residential driveway located approximately 20 feet east

of the tracks may be affected by vehicles stopped at the crossing; however, delays would be minimal.

- **Elm Street**. The maximum queue lengths and average delays along Elm Street are expected to be minimal. The driveways located 50 feet west and 120 feet east of the tracks would be impacted by the vehicles queued at the grade crossing; however, delays would be minimal.

- **High Street**. The maximum queue lengths and average delays at High Street are expected to be minimal. The residential driveway located on the east side of the tracks and Alexandra Drive on the west side of the tracks may be impacted due to the anticipated queued vehicles at the grade crossing; however, delays would be minimal.

- **Copicut Road**. On Copicut Road, the maximum queue lengths and average delays are expected to be minimal. The dirt driveway immediately east of the tracks may be impacted by vehicle queues; however the driveway serves very few vehicles and motorists would not likely be affected.

- **Beachwood Road**. The crossing along Beachwood Road is located approximately 150 feet east of the intersection of Route 79 at Beachwood Road. The safety implications of this proximate crossing require the Beachwood Road crossing to be closed and a cul-de-sac would be constructed on the east side of the tracks. Residential traffic destined to Route 79 would divert to Malbone Road. Since there is only one home on Beachwood Road, impacts of additional traffic on Malbone Road should be minimal.

- **Richmond Road/Route 79 (North)**. Richmond Road/Route 79 (North) is expected to have minimal queue lengths and average delays. The residential driveways located on both sides of the tracks would be slightly affected by the vehicles queued at this crossing.

Table 4.1-50 shows the traffic volumes and average delay at the remaining three grade crossings, which are expected to experience the most substantive delay.

Table 4.1-50 Freetown Grade Crossings—Traffic Volumes[1] and Average Delay (All Rail Alternatives)

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Forge Road (North)	1,200	80	80	50	31
Richmond Road (South)	4,900	215	200	100	34
Forge Road (South)	3,400	205	175	100	33

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Forge Road (North)**. The Forge Road (North) crossing occurs immediately north of the intersection of Richmond Road and Forge Road. The safety implications of this proximate crossing require the Forge Road (North) crossing to be closed and a cul-de-sac would be constructed on the west side of the tracks just west of the existing stream. Residential traffic currently using Forge Road to access Richmond Road would be diverted to Locust Street. Since Forge Road is a small residential street serving about 25 homes, traffic impacts on Locust Street due to this diversion are expected to be minimal. The southern leg of the

Richmond Road/Forge Road intersection would remain open to traffic. Queuing impacts are not expected along this section of Forge Road.

- **Richmond Road/Route 79 (South)**. On Richmond Road/Route 79 (South), a calculated queue length of 100 feet and average delays of 34 seconds are projected during peak periods. The residential driveway west of the tracks would be affected by any vehicles queued at the crossing and may need to be reconfigured to ensure vehicles exiting the driveway will be adequately protected by the proposed crossing signalized gate.

- **Forge Road (South)**. On Forge Road (South) a calculated queue length of 100 feet and average delays of 33 seconds are projected during peak periods. There may be impacts to driveways on both sides of the crossing due to the anticipated queued vehicles at the grade crossing.

Lakeville Grade Crossing (1) (All Rail Alternatives)—

- **Malbone Street**. The only public grade crossing in Lakeville, Malbone Street, currently carries active freight traffic and would be upgraded to accommodate the proposed commuter rail trains. The maximum queue lengths and average delays at this location are expected to be minimal.

Berkley Grade Crossings (5) (All Rail Alternatives)—All five grade crossings in Berkley (Cotley Street, Padelford Street, Myricks Street (Route 79), Mill Street, and Adams Lane) currently carry active freight traffic. Crossings at these locations would be upgraded to accommodate the proposed commuter rail trains.

- **Cotley Street and Padelford Street**. On Cotley Street and Padelford Street, the maximum queue lengths and average delays are expected to be minimal and there would be no impacts to driveways or intersections due to this grade crossing.

- **Myricks Street (Route 79)**. On Myricks Street (Route 79), maximum queue lengths and average delays are also expected to be minimal. Left turns from Grove Street could be affected by vehicles queued at the crossing. Grove Street could be delineated to accommodate separate left and right turn lanes to mitigate any delays. Vehicle queues at this crossing would also impact driveways on the west side of the crossing. Gates and locks are proposed to access the utility road on the northwest corner of the crossing.

- **Mill Street and Adams Lane (private)**. The Mill Street and Adams Lane private crossings are proposed to be closed.

Taunton Grade Crossings (2) (All Rail Alternatives)—Two public grade crossings on the New Bedford Main Line corridor are located in Taunton. Both the Ingell Street and Hart Street crossings currently are active crossings with freight train activity. These crossings would be upgraded to accommodate the proposed commuter rail trains. Table 4.1-51 shows the traffic volumes and average delay at these grade crossings.

Table 4.1-51 Taunton Grade Crossings—Traffic Volumes[1] and Average Delay

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Ingell Street	7,500	435	460	200	38
Hart Street	13,000	460	430	200	38

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Ingell Street**. Calculated queue lengths of 200 feet and average delays of 38 seconds are projected at Ingell Street during peak periods. Vehicle queues at this crossing will affect driveways on both sides of the crossing. The driveway immediately to the west of the crossing is proposed to be closed. There are no anticipated impacts to any intersections due to queued vehicles at the grade crossing.

- **Hart Street**. On Hart Street, a calculated queue length of 200 feet and average delays of 38 seconds are projected during peak periods. Alegi Avenue and driveways located within 250 feet of the tracks would be impacted by minor delays associated with the anticipated queues at the grade crossing.

Stoughton Alternatives Grade Crossing Impacts

The Stoughton Alternatives will require gates at grade crossings within Taunton, Raynham, Easton, Stoughton and Canton to be closed approximately six times an hour, or approximately 10 percent of the peak hour.

Taunton Grade Crossings (2) – Stoughton Alternative—Two public grade crossings associated with the Stoughton Alternative are located in Taunton. One grade crossing would be reactivated as part of the Stoughton Alternative (Longmeadow Road). The other grade crossing, Dean Street (Route 44) is currently active for freight rail only with frequencies of a few times a week. As described in Section 4.1.3.4, between Weir Junction and Winter Street in Taunton, existing train frequency is approximately two roundtrip freight trains (four total trips) per month. Train frequency near Ingell Street at Weir Junction ranges from three to five roundtrip freight trains (six to ten total trains) per week. There is no existing train frequency along the unused rail alignment from Stoughton station to Winter Street in Taunton. The Dean Street crossing would be upgraded to accommodate the proposed commuter rail trains. Table 4.1-52 shows the traffic volumes and average delay at both grade crossings. The Thrasher Street crossing is currently grade separated and is therefore not discussed in this section.

Table 4.1-52 Taunton Grade Crossings—Traffic Volumes[1] and Average Delay Stoughton Alternatives

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Winter Street/Longmeadow Road	13,300	510	635	275	41
Dean Street	33,500	910	880	875	109

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Longmeadow Road**. On Longmeadow Road, a calculated queue length of 275 feet and average delays of 41 seconds are projected during peak periods, and may affect the commercial driveways on both sides of the crossing. Existing driveways and parking areas immediately adjacent to the crossing would be reconfigured and/or closed.

- **Dean Street**. On Dean Street, a calculated queue length of 875 feet and average delays of 109 seconds are projected during peak periods, which may affect the driveways on both sides of the crossing and traffic operations at the adjacent Arlington Street intersection. This active grade crossing currently experiences similar (albeit infrequent) delays when freight trains service the various industrial uses in Taunton. As part of the proposed project, new traffic signal equipment and preemption phasing is recommended at the intersection of Dean Street and Arlington Street. The new signal layout will be coordinated with the AHCW system and preemption installed to adequately clear the vehicles queuing onto the tracks when a train is approaching. The intersection may also need to be reconfigured to safely direct pedestrians to the appropriate route.

Raynham Grade Crossings (6)—Six public grade crossings are located in Raynham. Five of the crossings are currently inactive and would be reactivated as part of the Stoughton Alternatives. The sixth grade crossing, across Broadway (Route 138), is projected to have relatively high traffic volumes (27,400 vehicles per day and 1,415 and 1,425 vehicles during the AM and PM peak), which would result in relatively long queues (700 feet) and delays (63 seconds). These queues and delays could affect Center Street and Britton Street traffic as well as numerous driveways in the proximity of the crossing. This public grade crossing would therefore be converted to a grade-separated crossing to minimize traffic impacts along this section of Route 138. Table 4.1-53 shows the traffic volumes and average delay at the five remaining grade crossings.

Table 4.1-53 Raynham Grade Crossings—Traffic Volumes[1] and Average Delay Stoughton Alternative

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Elm Street	1,900	100	65	50	32
Carver Street	6,800	335	385	175	37
Britton Street	1,300	65	65	50	31
King Phillip Street	4,100	295	350	150	36
East Britannia Street	4,700	335	415	175	37

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Elm Street**. On Elm Street, a calculated queue length of 50 feet and average delays of 32 seconds are projected during peak periods and could affect a residential driveway located 35 feet to the west of the crossing.

- **Carver Street**. A calculated queue length of 175 feet and average delays of 37 seconds are projected on Carver Street during peak periods and could affect a residential driveway located 100 feet west of the crossing. There is a culvert that may need to be reconstructed in proximity to this crossing.

- **Britton Street**. On Britton Street, a calculated queue length of 50 feet and average delays of 31 seconds are projected during peak periods, and may affect the residential driveways on both sides of the crossing.

- **King Phillip Street**. A calculated queue length of 150 feet and average delays of 36 seconds are projected at King Phillip Street during peak periods, and may affect residential driveways on both sides of the crossing. The driveway located adjacent to the tracks is currently within the railroad right-of-way for approximately 300 feet connecting with a property set back from King Phillip Street, and would need to be relocated outside of the railroad right-of-way to accommodate the proposed alignment.

- **East Britannia Street**. On East Britannia Street, calculated queue lengths of 175 feet and average delays of 37 seconds are projected during peak periods. Driveways and intersections along East Britannia Street are not expected to realize impacts due to the crossing.

Easton Grade Crossings (7) - Stoughton Alternatives—Seven public grade crossings are located in Easton. All of the crossings in Easton would be reactivated as part of the Stoughton Alternatives. Table 4.1-54 shows the traffic volumes and average delay at these grade crossings. The Main Street crossing is currently grade separated and is therefore not discussed in this section.

Table 4.1-54 Easton Grade Crossings—Traffic Volumes[1] and Average Delay Stoughton Alternatives

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Elm Street	5,000	175	295	125	35
Oliver Street	1,100	80	100	25	75
Short Street	4,800	220	240	100	34
Depot Street (Route 123)	19,700	1,085	885	475	48
Purchase Street	2,500	105	140	75	32
Prospect Street	2,200	90	120	75	32
Foundry Street (Route 106)	12,800	570	635	275	41

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Elm Street**. On Elm Street, a calculated queue length of 125 feet and average delay of 35 seconds are projected during the peak periods and could affect traffic operations at driveways near the crossing. Of particular concern is the driveway to the office/industrial building on the east side of the crossing. This driveway would be reconfigured.

- **Oliver Street**. On Oliver Street, a calculated queue length of 25 feet and average delay of 75 seconds during peak periods may affect driveways near the crossing. Of particular concern is the driveway to the office/industrial building on the northwest side of the crossing, which is adjacent to a play area. This driveway is within the railroad right-of-way; the driveway would be reconfigured and the play area (which is part of day care operation) would be relocated to safe location. The sidewalk would be extended through the crossing.

- **Short Street**. A calculated queue length of 100 feet and average delay of 34 seconds during peak periods on Short Street may affect the driveways immediately on either side of the crossing.

- **Depot Street (Route 123)**. On Depot Street (Route 123), a calculated queue length of 475 feet and average delays of 48 seconds during peak periods may affect the commercial and residential driveways immediately on either side of the crossing. The driveway immediately to the west of the crossing may need to be reconfigured.

- **Purchase Street**. A calculated queue length of 75 feet and average delay of 32 seconds at Purchase Street during the peak periods are considered to be minimal. However, the queue during peak periods may affect driveways and Granite Lane immediately adjacent to the crossing.

- **Prospect Street**. A calculated queue length of 75 feet and average delay of 32 seconds at Prospect Street during the peak periods are considered to be minimal. However, the queue may affect driveways immediately adjacent to the crossing.

- **Foundry Street**. On Foundry Street, the projected queue length of 275 feet and average delays of 41 seconds during peak periods may affect a residential driveway located 100 feet to the east.

- **Easton DPW driveway (private) and Gary Lane (private)**. On the Easton DPW driveway and Gary Lane (both private ways), the maximum queue lengths and average delays at the location are expected to be minimal. Gates and locks are being proposed for these locations. This location is not a public crossing.

Stoughton Grade Crossings (8) - Stoughton Alternatives—Eight public grade crossings are located in Stoughton and would be affected by the Stoughton and Whittenton Alternatives. Five of these grade crossings (Central Street, Simpson Street, School Street, Porter Street, and Wyman Street) are currently active rail crossings carrying commuter rail that would be modified to allow double-track operations. The addition of a second track and additional trains would result in negligible changes in traffic conditions or queue lengths at these crossings. A sixth crossing, at Brock Street crossing is considered active and has working signals but is rarely used today; therefore, for the purposes of this analysis, Brock Street is considered a reactivated crossing. Table 4.1-55 shows the traffic volumes and average delay at grade crossings in Stoughton that would be reactivated as part of the proposed project.

Table 4.1-55 Stoughton Grade Crossings—Traffic Volumes[1] and Average Delay Stoughton Alternatives

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Brock Street	3,260	440	810	750	105
Plain Street	8,000	370	510	225	39
Morton Street	1,700	125	180	100	33

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Brock Street**. On southbound Brock Street, a calculated queue length of 750 feet and average delay of 105 seconds are projected during the evening peak hour and would affect traffic operations at the intersection of Washington Street and Brock Street. Table 4.1-55 shows the traffic volume and average delay expected at the Brock Street grade crossing under the Build Condition.

- **Plain Street**. On Plain Street, the calculated queue length of 225 feet and average delay of 39 seconds may impact traffic operations at the intersection of Washington Street and Plain Street. These impacts are similar to those that may be realized at Brock Street, including impacts to driveways. Further study of the benefits of signalizing this intersection is also required and should be incorporated into a study with the Brock Street intersection.

- **Morton Street**. On Morton Street, a calculated queue length of 100 feet and an average delay of 33 sections would impact operations at the intersection of Washington Street and Morton Street. The grade crossing would be located approximately 25 feet west of this unsignalized intersection. When the crossing gates are down there would be insufficient storage distance for vehicles turning onto Morton Street from Washington Street. Private driveways immediately south of Morton Street would also experience the same difficulties. Additionally, the steep grade of Morton Street may pose a safety hazard in wet or snowy weather. To mitigate these concerns, Morton Street and the private driveways to the south would be closed and a bypass roadway constructed to the private grade separated crossing on Totham Farm Road. This concept would be further studied to evaluate the traffic impacts of these closures and the potential of rerouting traffic to Plain Street.

Canton Grade Crossings (3) - Stoughton Alternatives—Three crossings studied in Canton (Washington Street, Pine Street, and Will Drive) are located along the active commuter rail line. The construction of a second track along this section of the alignment and increased train activity would not result in substantial changes in traffic conditions or queue lengths at these crossings. As part of the proposed project, traffic signal preemption is recommended at the intersection of Washington Street and Revere Street to address queuing that may extend over the tracks during the peak hours.

Whittenton Alternatives Grade Crossing Impacts

Taunton Grade Crossings (12) – Whittenton Alternatives (12)—Twelve public grade crossings associated with the Whittenton Alternative are located in Taunton. This includes ten existing grade crossings along the existing, active Attleboro Secondary. The remaining two grade crossings consist of the reactivation of two inactive grade crossings at Whittenton Street and Warren Street. Table 4.1-56 shows the traffic volumes and average delay at these grade crossings. The Bay Street crossing is currently grade separated and is therefore not discussed in this section.

- **Whittenton Street**. A calculated queue length of 100 feet and average delays of 34 seconds are projected at Whittenton Street during peak periods, and may affect the commercial driveways on both sides of the crossing.

- **Warren Street**. Although traffic volume data was unavailable, Warren Street traffic volumes are anticipated to be low as a minor residential roadway. The maximum queue lengths and average delays are expected to be minimal at the Warren Street grade crossing location.

- **Danforth Street**. On Danforth Street, the maximum queue lengths and average delays are expected to be minimal and the projected queue of 125 feet would not impact any driveways or the Grosvenor Street or Perry Avenue intersections.

Table 4.1-56 Taunton Grade Crossings—Traffic Volumes[1] and Average Delay Whittenton Alternatives

Crossing	Traffic Volume (vpd)	AM Peak Volume	PM Peak Volume	Queue Length (feet)	Average Delay (seconds)
Whittenton Street	3,300	120	225	100	34
Warren Street	N/A	N/A	N/A	-	-
West Britannia St.	4,900	288	309	150	35
Danforth St.	4,045	213	272	125	35
Tremont St.	16,505	666	798	350	43
Oak St.	12,245	763	548	800	107
Porter St.	3,195	149	197	100	39
Cohannet St.	2,025	138	224	100	34
Winthrop St.	17,360	800	812	350	44
Harrison Ave.	2,025	163	124	75	33
Somerset Ave.	8,625	434	483	225	38
Weir St.	13,815	613	666	350	48

Source: MassDOT Highway Division supplemented by counts.
1 2030 Build Condition

- **Tremont Street**. The railroad corridor intersects Tremont Street at a skewed angle in a congested urban area with a number of business and residential driveways. This active grade crossing experiences similar (albeit infrequent) delays when freight trains service the various industrial uses in Taunton. The calculated queue length of 350 feet and average delays of 43 seconds are projected during peak periods, which may affect the driveways on both sides of the crossing and traffic operations at the adjacent Granite Street intersection. One driveway on the southbound approach would be reconfigured to access Tremont Street from the adjacent driveway curb cut.

- **Oak Street**. Located adjacent to the proposed Downtown Taunton Station and platform, the Oak Street crossing would have longer queues and delay due to the extended gate closure interval. A calculated 800 foot queue and 107 seconds of delay are projected during peak periods. The nearby traffic signal at the Oak Street and Tremont Street intersection has existing pre-emption for the tracks with an advance traffic signal mast arm located just west of the tracks to prevent queuing across the tracks. The South Coast Rail project would optimize the pre-emption settings for the Oak Street and Tremont Street intersection.

- **Porter Street**. With 39 seconds of delay and queue lengths of 100 feet or less, impacts are projected to be minimal at the Porter Street crossing. The projected queues may affect one or two residential driveways on either side of each crossing. Proposed grade crossing signal equipment locations will require the modification of one driveway. Guardrail is proposed along the railroad right-of-way to limit vehicular access from the abutting business.

- **Cohannet Street**. On Cohannet Street, the maximum queue lengths and average delays are expected to be minimal. However, the proposed grade crossing signal equipment locations would require reconfiguration of two driveways immediately on either side of the tracks and the closure of the driveway in the northwest quadrant.

- **Winthrop Street**. The Winthrop Street crossing is located between a small shopping center to the east and a residential area to the west. A calculated queue length of 350 feet and average delays of 44 seconds are projected during peak periods. Walnut Street, Harrison Street and driveways located within 350 feet of the tracks would be impacted by minor delays associated with the anticipated queues at the grade crossing. Supplemental advance railroad crossing signs are suggested for both Winthrop Street approaches due to sight distance restrictions to the east (horizontal alignment) and the west (vertical alignment).

- **Harrison Avenue**. On Harrison Avenue, the maximum queue lengths and average delays are expected to be minimal and the projected queue of 75 feet would only have minor impacts to a residential driveway and Walnut Street.

- **Somerset Avenue**. On Somerset Avenue, a calculated queue length of 225 feet and average delays of 38 seconds are projected during peak periods. East Walnut Street, Barnum Street and driveways located within 225 feet of the tracks may be impacted by minor delays associated with the anticipated queues at the grade crossing. The signalized intersection of Weir Street and Somerset Avenue is located approximately 430 feet to the north of the grade crossing. If the Whittenton Alternative is determined to be the LEDPA, intersection operations and queues should be evaluated to determine if signal pre-emption is required.

- **Weir Street**. On Weir Street, a calculated queue length of 350 feet and average delay of 48 seconds are projected during the peak periods and could affect traffic operations at driveways near the crossing and the intersections at White Street, Sumner Street and McSoley Avenue. Of particular concern is the proximity of the McSoley Street to the Weir Street crossing. McSoley Street intersects Weir Street within the active grade crossing area and therefore is proposed to be closed and traffic diverted to a new outlet to Weir Street. In addition, the driveway to the residence at the corner of Weir Street and White Street would be relocated from Weir Street to White Street. The driveway serving the property in the southeast quadrant would also be reconfigured.

Grade Crossing Incident Analysis

Table 4.1-57 summarizes the probability of an incident (regardless of the severity) occurring over the span of a year at each of the proposed at-grade crossings along the Stoughton Electric Alternative alignment as well as the probability of an incident occurring at each of the at-grade crossings that currently contain rail operations.

Table 4.1-57 Stoughton Electric Alternative Incident Predictor

Town/City	Street	Existing Probability. of an Incident/Year	Proposed Probability of an Incident/Year
Canton	Washington Street	7.9%	9.2%
	Pine Street	2.6%	2.9%
	Will Drive	2.2%	2.6%
Stoughton	Central Street	3.4%	4.1%
	Simpson Street	2.2%	2.6%
	School Street	2.7%	3.4%
	Porter Street	3.0%	3.5%
	Wyman Street	2.4%	2.9%
	Brock Street	2.4%	2.9%
	Plain Street	N/A	3.4%
Easton	Elm Street	N/A	4.0%
	Oliver Street	N/A	2.9%
	Gary Lane	N/A	3.6%
	Short Street	N/A	4.1%
	Depot Street	N/A	6.5%
	Purchase Street	N/A	3.6%
	Prospect Street	N/A	3.6%
	Foundry Street	N/A	6.0%
Raynham	Greyhound Park	N/A	0.4%
	Elm Street	N/A	4.0%
	Carver Street	N/A	5.7%
	Britton Street	N/A	3.3%
	King Phillip Street	N/A	4.0%
	East Britannia Street	N/A	4.4%
Taunton	Longmeadow Road	N/A	5.7%
	Dean Street – Route 44	1.3%	7.4%
	Ingell Street	8.9%	4.5%
	Pratt Street	0.8%	3.8%
Berkley	Cotley Street	0.3%	1.7%
	Padelford Street	0.5%	2.6%
	Myricks Street (Route 79)	0.6%	3.7%
Lakeville	Malbone Street	0.4%	2.4%
Freetown	Chace Road	0.4%	0.0%
	Braley Road	0.4%	4.0%
	East Chipaway Road	0.4%	3.8%
	Richmond Road - North	0.4%	4.0%
	Richmond Road - South	0.4%	4.0%
	Forge Road - South	0.4%	2.6%
	Elm Street	0.4%	2.8%
	High Street	0.3%	2.0%

Town/City	Street	Existing Probability. of an Incident/Year	Proposed Probability of an Incident/Year
	Copicut Road	0.2%	2.4%
	Brightman Lumber	0.1%	0.5%
New Bedford	Samuel Barnet Road	0.5%	2.9%
	Pig Farm Road	0.1%	4.0%
	Tarkiln Hill Road	0.5%	4.1%
	Nash Road	0.7%	4.0%

NA – Not Active

- *Canton* – Washington Street has the highest probability at 9.2 percent. This would be approximately one incident every 11 years.
- *Stoughton* – Central Street has the highest probability at 4.1 percent. This would be approximately one incident every 24 years.
- *Easton* – Depot Street has the highest probability at 6.5 percent. This would be approximately one incident every 15 years.
- *Raynham* – Carver Street has the highest probability at 5.7 percent. This would be approximately one incident every 18 years.
- *Taunton* – Dean Street (Route 44) has the highest probability at 7.4 percent. This would be approximately one incident every 14 years.
- *Berkley* – Myricks Street (Route 79) has the highest probability at 3.7 percent. This would be approximately one incident every 27 years.
- *Lakeville* – Malbone Street has the highest probability at 2.4 percent. This would be approximately one incident every 42 years.
- *Freetown* –Braley Road and Richmond Road have the highest probabilities at 4.0 percent. This would be approximately one incident every 25 years.
- *New* Bedford –Tarkiln Hill Road has the highest probability at 4.1 percent. This would be approximately one incident every 24 years.
- *Taunton* – West Britannia Street has the highest probability of future incidents at 4.1 percent. This would be approximately one incident every 25 years.

Table 4.1-58 summarizes the probability of an incident occurring over the span of a year at each of the proposed at-grade crossings along the Attleboro Secondary and Whittenton Branch portion of the Whittenton Electric Alternative alignment. This is the only portion of the Whittenton Alternatives alignment that differs from the Stoughton Alternatives. Incident probabilities along the shared portions of the alignment would be the same under the Whittenton Alternatives as listed in Table 4.1-57 for the Stoughton Alternatives.

Table 4.1-58 Whittenton Electric Incident Predictor, Attleboro Secondary and Whittenton Branch

Town/City	Street	Existing Probability of an Incident/Year	Proposed Probability of an Incident/Year
Taunton	Whittenton Street	0.0%	0.4%
	Warren Street	0.0%	0.4%
	West Britannia Street	0.7%	4.1%
	Danforth Street	0.7%	2.6%
	Tremont Street	1.0%	3.5%
	Oak Street	1.0%	3.5%
	Porter Street	0.7%	2.6%
	Cohannet Street	0.6%	2.6%
	Winthrop Street	1.0%	3.7%
	Harrison Avenue	0.6%	2.6%
	Somerset Avenue	0.8%	3.5%
	Weir Street	0.8%	3.5%

NA – Not Active

Along the Attleboro Secondary and Whittenton Branch portion of the Whittenton Alternatives, West Brittania Street would have the highest future incident probability at 4.1 percent. This would be equivalent to approximately one incident every 25 years. Danforth Street, Porter Street, Cohannet Street, and Harrison Avenue have the lowest future probability at 2.6 percent. This would be equivalent to approximately one incident every 39 years. The average probability that an incident would occur at any of the Whittenton Alternative at-grade crossings is 4.677 percent per year. By comparison, the Stoughton Alternative's Dean Street (Route 44) grade crossing along the portion of the Stoughton Line bypassed by the Whittenton Alternatives has the highest future incident probability at 7.4 percent, which would be equivalent to approximately one incident every 14 years. The average probability that an incident would occur at any of the Stoughton Alternative at-grade crossings is 4.944 percent per year.

Although both the Stoughton and Whittenton Alternatives have similar probabilities of an incident occurring at any one crossing, the probability of an incident along the Whittenton Alternative alignment in Taunton is double that of the Stoughton Alternative alignment because there are roughly double the number of grade crossings on the Whittenton alignment in Taunton.

According to MBTA data, the predicted frequency of an incident occurring throughout the MBTA's system and its 333 active at-grade crossings is 0.0199 in one year. The historical data from the past 10 years of an incident at any of the 333 active at-grade crossings in the MBTA's system has an observed probability of 0.009 in one year. Although the predicted frequency of an incident under the Stoughton Alternatives is 0.03618 in one year, the measures and precautions taken by the MBTA have made the probability less likely and provide a historical probability of 0.0009 in one year. With the MBTA continuing to take safety measures and precautions at all of their crossings on the South Coast Rail project, the predicted incident rate of 0.03618 is likely to be less.

Stations

Transportation analyses for the alternatives were conducted for all the planned station locations associated with the rail alternatives. The analysis of transportation impacts is based on projected ridership at each station. Since some stations are included in more than one alternative, each station

was analyzed only once using the highest ridership projection for the station from among the alternatives. This approach results in a worst case scenario analysis. As with the No-Build analysis, the Build analysis results are presented by community and station. For each of the stations analyzed (except for Taunton Station and Dana St. Station as explained below), vehicle trip generation was estimated based on these 2030 ridership forecasts.

To determine the potential impact the revised 2035 ridership results could have on the DEIS/DEIR traffic analyses and findings, 2035 ridership data were compared to the 2030 ridership data. Details of the comparison for the Stoughton and Whittenton Alternatives are shown in Appendix 3.2-H. In general, 2035 boardings are lower than the 2030 boardings, with a few exceptions. The Stoughton Electric 2035 ridership projects slightly higher inbound boardings during the morning peak period at three stations: Taunton, Fall River Depot, and Kings Highway. Breaking these increases down further to peak hour analysis of various travel modes, less than 26 additional vehicles are projected to drive and park at Fall River Depot and Kings Highway stations. Approximately 10 additional kiss and ride trips are projected for these two stations. Increases of peak hour trips at the Taunton Station are more significant, with Taunton Station projected to add 78 park and ride trips and 43 kiss and ride peak hour trips over the trip generation estimated in the DEIS/DEIR. While Fall River Depot and Kings Highway reflect minimal change in ridership, updated 2035 traffic analysis is provided for the Taunton Station.

In addition to Taunton Station, this section also presents traffic analysis for Dana Street Station, which was not included in the DEIS/DEIR station-level traffic impact analysis. It analyzes the transportation impacts of relocating the proposed Downtown Taunton Station, previously proposed as part of the Whittenton Alternative.

The 2030 DEIS/DEIR station boarding estimates were used to prepare traffic impact analyses for the relocated Stoughton Station.

The results of the Build analyses are presented for signalized and unsignalized intersections by community. The results include No-Build conditions LOS and highlight locations that operate at unacceptable levels of service during at least one peak hour. Intersections that degrade to unacceptable levels of service from No-Build conditions are denoted in **bold**. LOS analyses for all intersections are provided in Appendix 4.1-I.

New Bedford Transportation Impacts (All Rail Alternatives)

The two station locations proposed in New Bedford include:

- Whale's Tooth, which would be located east of Route 18 and north of Route 6
- King's Highway, which would be located south of King's Highway, east of the Route 140 interchange

The Whale's Tooth Station would be located between the intersections of Acushnet Avenue at Hillman Street and the intersection of Acushnet Avenue at Pearl Street. Access to the proposed station would be via an unsignalized driveway on Acushnet Avenue. An existing bus stop is located immediately adjacent to the proposed station. Logan Street and Hillman Street provide pedestrian and bicycle connections to the station from the neighborhood west of Route 18.

The King's Highway Station is located behind the existing retail mall in the Shaw's Shopping Center. Access to the proposed station would be provided via the signalized Shaw's Shopping Center driveway. Pedestrian access would be provided via a pedestrian walkway across from Tarkiln Hill Road. Bicycle access would be provided via King's Highway and the proposed station driveway.

Traffic Operations—Design year (2030) Build condition traffic volumes for the study area roadways were determined by estimating site-generated traffic volumes and distributing these volumes over study area roadways within New Bedford. These site generated volumes were added to the No-Build traffic volumes to create the 2030 Build condition traffic volume networks, which are depicted in Figures 4.1-54 through 4.1-57.

The projected number of vehicle trips in and out of the Whale's Tooth and King's Highway stations during the morning and evening peak hours are shown in Table 4.1-59. The trip generation for the New Bedford stations is based on ridership projections for the Attleboro Alternative.

Table 4.1-59 Park-and-Ride and Vehicular Drop-Off Vehicle Trips:[1] New Bedford Stations

		Morning Peak Hour		Evening Peak Hour	
Station	**Type of Trip**	**In**	**Out**	**In**	**Out**
Whale's Tooth	Park-and-Ride	146	16	10	120
	Drop-off	44	44	35	35
	Total Vehicles	190	60	45	155
King's Highway	Park-and-Ride	143	16	8	114
	Drop-off	28	28	21	21
	Total Vehicles	171	44	29	135

1 The number of park-and-ride vehicle trips is calculated by dividing the number of park-and-ride riders by a 1.05 vehicle occupancy rate (VOR). The number of vehicular drop-off vehicle trips assumes one rider per vehicle.

The directional distribution of station-generated traffic is a function of population distribution, vehicle-owning households, existing travel patterns on area roadways, and traffic conditions. The trip distribution for the park-and-ride trips associated with New Bedford stations is based on ridership data provided by CTPS, which take into account these factors. Table 4.1-60 provides the geographic distribution of these trips.

Table 4.1-60 New Bedford Trip Distribution

To/From	King's Highway Station	Whale's Tooth Station
North	8%	21%
South	27%	17%
East	23%	30%
West	43%	32%

Source: CTPS Travel Demand Model.

The park-and-ride traffic was distributed to the study area roadways based on these percentages. Drop-off traffic was added separately and is based on existing travel patterns on area roadways near the proposed station locations.

The intersection levels of service based on the addition of rail related traffic are shown in Table 4.1-61. At most of the signalized or unsignalized intersections analyzed, no traffic operating deficiencies would

be created by the Whale's Tooth Station. Four unsignalized locations would continue to operate at a deficient LOS E and LOS F during one or both peak hours. These include Coggeshall Street at North Front Street during both peak hours and Coggeshall Street at Purchase Street, Purchase Street at Weld Street and Purchase Street at Route 18 SB ramp during the evening peak hour. The station driveway would operate at LOS B during both peak hours.

There would be no changes from acceptable LOS at the intersections analyzed for the King's Highway station. The unsignalized intersections of Mount Pleasant Street and Route 140 SB Ramps would continue to operate at LOS F during the morning peak hour as it does under No-Build conditions. The intersection of King's Highway at Mount Pleasant Street and the unsignalized intersections of Church Street at Park Avenue, Mount Pleasant Street and Route 140 SB Ramps and King's Highway at Tarkiln Hill Road would continue to operate at LOS E or F during the evening peak hour as they do under No-Build conditions.

Traffic Signal Warrants—Six intersections were evaluated against the traffic signal warrant for the peak hour period:

- Coggeshall Street at North Front Street
- Coggeshall Street at Purchase Street
- Purchase Street at Weld Street and Route 18 southbound ramp
- Purchase Street at Route 18 southbound ramp
- Mount Pleasant Street at Route 140 southbound ramps
- Acushnet Avenue at Station Driveway

The intersection of Coggeshall Street at North Front Street meets the requirements set forth by the MUTCD for traffic signal installation based on future peak hour traffic volumes.

The Coggeshall Street at Purchase Street intersection potentially meets the crash experience warrant by having more than five correctable crashes in a recent one-year period. A full eight-hour warrant analysis will be required to confirm this warrant. This analysis would be completed during the preliminary engineering phase of the project. The Mount Pleasant Street at Route 140 southbound ramps intersection is projected to meet peak hour traffic signal warrants with or without the South Coast Rail project. Project traffic through this intersection constitutes only a minor 2 percent increase in traffic from No-Build conditions.

The Purchase Street at Weld Street and Route 18 southbound ramp, Purchase Street at Route 18 southbound ramp and the Acushnet Avenue at Station Driveway intersections do not meet peak hour traffic signal warrants based on the projected future traffic volumes.

Table 4.1-61 New Bedford Intersection Capacity Analysis–2030 Build Conditions vs. 2030 No-Build Conditions All Alternatives

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	No-Build	Build			No-Build	Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Whale's Tooth Station								
Hillman St at Purchase St.	B	0.42	13	B	B	0.60	15	B
Mill St at Pleasant St	F	0.82	>80	F	E	0.94	79	E
Union St. at Rt. 18 SB	E	0.92	78	E	F	>1.00	>80	F
Union St at McArthur Dr.	C	0.50	33	C	D	0.47	43	D
Rt. 18 NB at Coggeshall St.	B	0.51	18	B	B	0.58	19	B
Rt. 18 SB at Coggeshall St.	D	0.87	44	D	C	0.74	31	C
Coggeshall St. at Belleville Ave.	B	0.72	20	C	B	0.72	20	C
King's Highway Station								
King's Hwy. at Rt. 140 NB Ramps	B	0.60	22	C	C	0.93	29	C
Rt. 18 at Wood St	C	0.58	21	C	B	0.68	17	B
Church St. at Nash Rd	B	0.58	18	B	C	0.92	31	C
Church St. at Tarkiln Hill Rd	B	0.71	28	C	D	0.89	37	D
King's Highway at Stop & Shop driveway	A	0.50	9	A	B	0.73	15	B
King's Highway at Shaw's driveway (Station driveway)	A	0.41	7	A	A	0.62	9	A
King's Highway at Mt. Pleasant St.	B	0.54	26	C	E	>1.00	62	E
Unsignalized Intersections	No-Build	Critical Movement	Delay[4]	LOS	No-Build	Critical Movement	Delay	LOS
Whale's Tooth Station								
Hillman St. at McArthur Dr.	B	Hillman EB L/R	17	C	B	Hillman EB L/R	16	C
McArthur Dr. at Herman Melville Blvd.	B	Melville WB L/R	16	C	C	Melville WB L/R	19	C
Coggeshall St. at Purchase St.	C	Purchase SB All	20	C	F	Purchase NB All	>50	F
Coggeshall St. at N. Front St.	F	N. Front St. NB All	>50	F	F	N. Front St. NB All	>50	F
Purchase St. at Weld St.	C	Weld WB L	27	D	F	Weld WB L	>50	F
Logan St. at Purchase St.	C	Logan WB L/R	17	C	C	Logan WB L/R	24	C
Logan St. at McArthur Dr.	B	Logan WB All	12	B	B	Logan WB All	13	B
Logan St. at N. Front St.	C	Logan EB All	28	D	C	Logan EB All	27	D
Wamsutta St. at N. Front St.	B	Wamsutta EB All	11	B	B	Wamsutta EB All	13	B
Wamsutta St. at McArthur Dr.	A	Wamsutta WB L/R	10	B	A	Wamsutta WB L/R	10	B
Whale's Tooth Station driveway at McArthur Dr.	N/A	Driveway WB L/R	11	B	N/A	Driveway WB L/R	12	B
Purchase St. at Rt. 18 SB Exit Ramp	D	Rt. 18 WB All	29	D	E	Rt. 18 WB All	49	E
King's Highway Station								

Unsignalized Intersections (continued)	No-Build	Critical Movement	Delay[4]	LOS	No-Build	Critical Movement	Delay	LOS
Mt. Pleasant St. at Rt. 140 SB Ramps	F	Off-Ramp WB L/R	>50	F	F	Off-Ramp WB L/R	>50	F
Church St. at Park Ave.	C	Park WB All	23	C	F	Park WB All	>50	F
Church St. at Irvington St.	B	Irvington WB All	16	C	C	Irvington EB All	23	C
King's Highway at Tarkiln Hill Rd.	D	Tarkiln EB L/R	28	D	F	Tarkiln EB L/R	>50	F

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Pedestrians and Bicycles—The travel demand and ridership estimates completed by CTPS indicate that about 150 pedestrian/bicycle trips would access the Whale's Tooth Station on a daily basis; which would increase pedestrian and bicycle activity in the vicinity of Acushnet Avenue. At King's Highway Station, approximately 120 pedestrian/bicycle trips could be expected. The majority of the infrastructure needed to support non-motorized transportation at both proposed station exists currently and would not be adversely impacted by the change in number of pedestrians or bicyclists on study area roadways.

Traffic signal timing and phasing changes would be required at the intersection of Mill Street at Pleasant Street to accommodate pedestrian demands. These changes are discussed further in Section 4.1.5, Mitigation Measures. Pedestrian demands associated with the proposed Whale's Tooth Station would also require a new sidewalk on Acushnet Avenue between Hillman Street and the proposed station driveway and a crosswalk across Acushnet Avenue at Hillman Street.

To accommodate increased pedestrian demand at King's Highway Station, changes to the pedestrian signal phases at the intersections of Church Street/Tarkiln Hill Road and Jones Street/Mount Pleasant Street would be required. These changes are discussed further in Section 4.1.5, Mitigation Measures.

Neither of the proposed New Bedford Station locations would physically alter designated bicycle facilities nor disrupt future plans for either on-road or off-road facilities in the study area. To accommodate demand, bicycle parking and storage locations would be maximized using available space.

Parking—The Whale's Tooth station is proposed to have 694 parking spaces (15 of these handicapped accessible) to serve as a shared use parking facility with existing ferry service. The proposed project would not physically alter the existing public parking supply or impact parking availability within New Bedford. Based on the projected daily park-and-ride ridership, the parking supply would be sufficient to meet the peak parking demand for 310 spaces. The surplus of 384 spaces would remain available for ferry passenger use.

The King's Highway station is proposed to have 360 spaces (12 of these handicapped accessible) to serve as a shared use parking facility with the existing cinema. Since peak parking demand for the cinema would occur during the evening, after most commuters have returned home, the available parking supply should be adequate to meet the commuter rail peak demand for 300 spaces.

Freetown Transportation Impacts

The Freetown station site would be located east of South Main Street south of Route 24 Exit 9 between the Stop & Shop Distribution Center and the planned entrance to the Riverfront Business Park (on the opposite side of the roadway). Access to the proposed station would be via an unsignalized driveway and adjacent sidewalk, thus providing access for all users.

Traffic Operations—As discussed above, design year (2030) Build condition traffic volumes for the study area roadways were determined by estimating site-generated traffic volumes and distributing these volumes over study area roadways within Freetown. These site generated volumes were added to the No-Build traffic volumes to create the 2030 Build condition traffic volume networks, which are depicted in Figures 4.1-58 and 4.1-59.

The projected number of vehicle trips in and out of the Freetown station during the morning and evening peak hours are shown in Table 4.1-62. The trip generation for this station is based on the projected ridership with the Stoughton Alternative.

Table 4.1-62 Park-and-Ride and Vehicular Drop-Off Vehicle Trips:[1] Freetown Station

		Morning Peak Hour		Evening Peak Hour	
Station	**Type of Trip**	**In**	**Out**	**In**	**Out**
Freetown	Park-and-Ride	81	9	5	45
	Drop-off	17	17	9	9
	Total Vehicles	98	26	14	54

1 The number of park-and-ride vehicle trips is calculated by dividing the number of park-and-ride riders by a 1.05 vehicle occupancy rate (VOR). The number of vehicular drop-off vehicle trips assumes one rider per vehicle.

The trip distribution for the park-and-ride trips associated with the Freetown Station is based on ridership data provided by CTPS, which take into account factors such as population, existing travel patterns, and traffic congestion, as noted above. Table 4.1-63 provides the geographic distribution of these trips.

Table 4.1-63 Freetown Trip Distribution

To/From	Distribution
North	54%
South	41%
East	5%
West	0%

Source: CTPS Travel Demand Model.

The park-and-ride traffic was distributed to the study area roadways based on these percentages. Drop-off traffic was added separately and is based on existing travel patterns on area roadways near the proposed station locations.

The intersection levels of service based on the addition of rail related traffic are shown in Table 4.1-64. Seven signalized intersections were analyzed under No-Build and Build conditions. All but one location would operate at acceptable levels of service under both conditions. The intersection of South Main Street at the Route 24 northbound ramps would continue to operate at LOS E during the evening peak

hour. No additional unsignalized intersections would become deficient during either the morning or evening peak hour.

Table 4.1-64 Freetown Intersection Capacity Analysis—2030 Build Conditions vs. No-Build Conditions All Alternatives

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	No-Build	Build			No-Build	Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS[1]	V/C	Delay	LOS
Freetown Station								
S. Main St. at Rte. 24 SB Ramps	A	0.59	7	A	B	0.64	10	B
S. Main St. at Rte. 24 NB Ramps	C	0.99	37	D	E	>1.00	74	E
S. Main St. at Payne's Crossing Driveway	A	0.33	2	A	B	0.49	13	B
Executive Park Dr. at S. Main St.	B	0.83	21	C	D	0.84	44	D
Executive Park Dr. at Rt. 24 SB Off-Ramps	C	0.86	30	C	C	0.90	24	C
Executive Park Dr. at Rt. 24 NB Off-Ramps	B	0.84	15	B	A	0.52	8	A
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Move-ment	Delay	LOS
Freetown Station								
S. Main St. at High St.	F	NW All	>50	F	F	NW All	>50	F
S. Main St. at Ridge Hill Rd.	F	NW All	>50	F	F	NW All	>50	F
S. Main St. at Narrows Rd.	D	Narrows L/R	34	D	F	Narrows L/R	>50	F
S. Main St. at Copicut St.	B	Copicut L/R	16	C	B	Copicut L/R	15	C
Freetown Station Driveway at S. Main St.	N/A	Driveway L/R	14	B	N/A	Driveway L/R	16	C

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All=all movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound Traffic Signal Warrants

Traffic Signal Warrants—Four intersections were evaluated against the traffic signal warrant for the peak hour period:

- South Main Street at High Street
- South Main Street at Ridge Hill Road
- South Main Street at Narrows Road
- South Main Street at Freetown Station Driveway

The South Main Street and Ridge Hill Road intersection is projected to meet peak hour traffic signal warrant during the evening peak hour with or without the South Coast Rail project. Project traffic

through this intersection would constitute only a minor 1.5 percent increase in traffic from No-Build conditions.

The other unsignalized intersections along South Main Street do not meet peak hour traffic signal warrants based on the projected future traffic volumes.

Pedestrians and Bicycles—The travel demand and ridership estimates completed by CTPS indicate that about 40 pedestrian/bicycle trips would access Freetown Station on a daily basis which would increase pedestrian and bicycle activity along South Main Street. The majority of the infrastructure needed to support pedestrian and bicycle traffic to the proposed station exists currently and would not be adversely impacted by the change in number of pedestrians or bicycles on study area roadways.

To accommodate pedestrian demands, the existing sidewalk along the east side of South Main Street would be extended south (about 1,600 feet) to the station driveway.

The proposed station location would not physically alter designated bicycle facilities or disrupt future plans for either on road or off-road facilities in the study area. To accommodate demand, bicycle parking and storage locations would be maximized using available space.

Parking—Freetown Station is proposed to have 174 parking spaces (of which seven would be handicapped accessible). An additional eight parking spaces would be reserved for drop-off activity. The proposed project would not physically alter the existing public parking supply or impact parking availability within Freetown. Based on the projected daily park-and-ride ridership, the parking supply would be sufficient to meet the peak parking demand for 170 spaces.

Fall River Transportation Impacts (All Rail Alternatives)

Fall River has two proposed station locations that would serve both the Stoughton and Whittenton Alternatives:

- Fall River Depot, which would be located 1 mile north of downtown Fall River on North Davol Street between Pearce Street and Turner Street.
- Battleship Cove, which would be located on Ponta Delgada Boulevard west of Route 138 and south of I-195 and the Fall River Heritage State Park.

Access to the proposed Fall River Depot Station would be via an unsignalized driveway located on North Davol Street. A separate entrance and exit driveway are provided for drop-off traffic and connecting local bus service. Pearce Street and Turner Street provide pedestrian and bicycle connections to the station from the neighborhood east of the railroad tracks.

At Battleship Cove, access to the proposed station would be provided via a drop-off loop on Ponta Delgada Boulevard. No parking is proposed for this station. Pedestrian and bicycle access would also be provided via Water Street and Ponta Delgada Boulevard.

Traffic Operations—As discussed above, design year (2030) Build condition traffic volumes for the study area roadways were determined by estimating site-generated traffic volumes and distributing these volumes over study area roadways within Fall River. These site generated volumes were added to the

No-Build traffic volumes to create the 2030 Build condition traffic volume networks, which are depicted in Figures 4.1-60 and 4.1-61.

The projected number of vehicle trips in and out of the Fall River Depot and Battleship Cove stations in the morning and evening peak hours are shown in Table 4.1-65. The trip generation of the Fall River stations is based on projected ridership for the Attleboro Alternative.

Table 4.1-65 Park-and-Ride and Vehicular Drop-Off Vehicle Trips:[1] Fall River Stations All Alternatives

Station	Type of Trip	Morning Peak Hour In	Morning Peak Hour Out	Evening Peak Hour In	Evening Peak Hour Out
Fall River Depot	Park-and-Ride	184	25	14	166
	Drop-off	26	26	22	22
	Total Vehicles	210	51	36	188
Battleship Cove	Park-and-Ride	0	0	0	0
	Drop-off	34	34	25	25
	Total Vehicles	34	34	25	25

1 The number of park-and-ride vehicle trips is calculated by dividing the number of park-and-ride riders by a 1.05 vehicle occupancy rate (VOR). The number of drop-off vehicle trips assumes one rider per vehicle.

The directional distribution of station-generated traffic is a function of population distribution, vehicle-owning households, existing travel patterns on area roadways, and traffic conditions. The trip distribution for the park-and-ride trips associated with Fall River Depot Station is based on ridership data provided by CTPS, which take into account these factors. Table 4.1-66 provides the geographic distribution of these trips.

Table 4.1-66 Fall River Trip Distribution

To/From	Distribution
North	20%
South	58%
East	22%
West	0%

Source: CTPS Travel Demand Model.

The park-and-ride traffic was distributed to the study area roadways based on these percentages. Drop-off traffic was added separately and is based on existing travel patterns on area roadways near the proposed station locations. Only drop-off traffic was generated by Battleship Cove Station, as no long-term parking is planned.

The intersection levels of service based on the addition of rail related traffic are shown in Table 4.1-67. Three signalized and five unsignalized intersections, including the station driveway, were analyzed for the Fall River Depot station under Build conditions. All intersections would operate at acceptable levels of service.

Table 4.1-67 Fall River Intersection Capacity Analysis—2030 Build Conditions vs. No-Build Conditions, All Rail Alternatives

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	No-Build	Build			No-Build	Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS[1]	V/C	Delay	LOS
Fall River Depot Station								
S. Davol St. at President Ave.	C	0.70	25	C	C	0.66	24	C
N. Davol St. at President Ave.	B	0.53	19	B	C	0.72	22	C
N. Main St. at President Ave.	C	0.86	37	D	D	0.93	38	D
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
Fall River Depot Station								
Turner St. at N. Davol St.	B	Turner WB R	16	C	B	Turner WB R	15	C
Pearce St. at N. Davol St.	B	Pearce WB R	13	B	B	Pearce WB R	17	C
Davol St. SB to NB U-turn near Cedar St.	B	U-turn SW L	13	B	B	U-turn SW L	13	B
Davol NB to SB U-turn near Cedar St	B	U-turn NE L	19	C	B	U-turn NE L	14	B
Fall River Depot Station Driveway at N. Davol St.	N/A	Driveway WB R	13	B	N/A	Driveway WB R	17	C
Battleship Cove Station								
Ponta Delgada at Anawan St.	C	Anawan EB All	16	C	C	Anawan WB All	17	C
Ferry St. at Ponta Delgada	B	Ferry EB L/R	16	C	B	Ferry EB L/R	13	B
Anawan St. at Davol St.	F	Davol SB All	>50	F	F	Davol SB All	>50	F
Central St. at Davol St.	F	Central WB L	>50	F	F	Central WB L	>50	F
Battleship Cove Station driveway at Ponta Delgada	N/A	Driveway WB L/R	12	B	N/A	Driveway WB L/R	12	B

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

The Battleship Cove station is not anticipated to serve a substantial amount of regular commuter rail ridership but is intended to provide tourist access to the attractions at Battleship Cove. There would be limited space available to accommodate drop-off and pick-up activity. No substantial change in LOS would occur at the four unsignalized intersections that were analyzed. The proposed station driveway would operate at LOS B during both peak hours.

Traffic Signal Warrants—Three intersections were evaluated against the traffic signal warrant for the available peak hour periods:

- Anawan Street at Davol Street
- Central Street at Davol Street
- North Davol Street at Station Driveway

The Anawan Street at Davol Street intersection is projected to meet peak hour traffic signal warrants with or without the South Coast Rail project. Project traffic through this intersection constitutes only a minor 3 percent increase in traffic from No-Build conditions.

The Central Street at Davol Street and the North Davol Street at Station Driveway intersections do not meet peak hour traffic signal warrants based on the projected future traffic volumes.

Pedestrians and Bicycles—The travel demand and ridership estimates completed by CTPS indicate that about 280 non-motorized person trips (pedestrians and bicycles) would access Fall River Depot Station on a daily basis which would increase pedestrian and bicycle activity in the vicinity of President Avenue, Davol Street, and North Main Street. At Battleship Cove Station, approximately 180 pedestrian/bicycle trips would be expected. The majority of the pedestrian and bicycle infrastructure needed to support both proposed stations exists currently and would not be adversely impacted by the change in number of pedestrians or bicyclists on study area roadways.

Traffic signal timing and phasing changes would be required at the intersections of Davol Street Northbound/President Avenue and North Main Street/President Avenue to accommodate pedestrian demands at Fall River Depot Station. These changes are discussed further Section 4.1.5, Mitigation Measures.

To accommodate increased pedestrian demand at Battleship Cove Station, crosswalks across Broadway and Central Street would be restriped. Sidewalks and crosswalks elsewhere in the vicinity of Battleship Cove are adequate to handle the expected demand.

Neither of the proposed station locations would physically alter designated bicycle facilities nor disrupt future plans for either on-road or off-road facilities in the study area. To accommodate demand, bicycle parking and storage locations would be maximized using available space.

Parking—The Fall River Depot station is proposed to have 513 parking spaces (of which 11 would be handicapped accessible). An additional 10 parking spaces would be reserved for drop-off activity. The proposed project would not physically alter the existing public parking supply or impact parking availability within Fall River. Based on the projected daily park-and-ride ridership, the parking supply would be sufficient to meet the peak parking demand for 430 spaces. No short or long-term parking would be provided at Battleship Cove.

Taunton Transportation Impacts

Traffic operations were analyzed for three station locations in the City of Taunton:

- Taunton Depot (all alternatives), which would be accessible from Route 140 west of the Route 24 interchange
- Dana Street (Whittenton Alternatives)
- Taunton (Stoughton Alternative), which would be located on Arlington Street just north of Dean Street (Route 44)

The Taunton Depot Station (associated with both rail alternatives) would be located behind the existing retail mall at Taunton Depot Drive. Access to the proposed station would be provided via the signalized intersection of Route 140 and Taunton Depot Drive. Pedestrian access would be provided via a

pedestrian walkway along Route 140 and pedestrian crossing controls at Taunton Depot Drive. Bicycle access would be provided via Route 140 and Taunton Depot Drive.

Access to the proposed Dana Street Station (associated with the Whittenton Alternative) would be via unsignalized intersections Dana Street. Pedestrian walkways would be provided that lead to the platform. Additional sidewalks would be constructed along Dana Street and Danforth Street.

At Taunton Station (Dean Street) (associated with the Stoughton Alternative), access to the proposed station would be provided via an unsignalized intersection on Arlington Street. Major access to the station would be provided from the signalized intersection of Arlington Street with Dean Street. Pedestrian access would be provided via pedestrian sidewalks along Dean Street and Arlington Street. Bicycle access would be provided via Arlington Street and Dean Street.

Traffic Operations- Taunton Depot Station—Design year (2030) Build condition traffic volumes for the study area roadways were determined by estimating site-generated traffic volumes and distributing these volumes over study area roadways within Taunton. These site generated volumes were added to the No-Build traffic volumes to create the 2030 Build condition traffic volume networks, which are depicted in Figures 4.1-62 and 4.1-63.

The projected number of vehicle trips in and out of the Taunton Depot station in the morning and evening peak hours are shown in Table 4.1-68. The trip generation is based on the DEIS/DEIR projected ridership for the Stoughton Alternative.

Table 4.1-68 Park-and-Ride and Vehicular Drop-Off Vehicle Trips:[1] Taunton Depot Station

Station	Type of Trip	Morning Peak Hour In	Morning Peak Hour Out	Evening Peak Hour In	Evening Peak Hour Out
Taunton Depot (all alternatives)	Park-and-Ride	160	20	12	128
	Drop-Off	18	18	14	14
	Total Vehicles	178	38	36	144

1 The number of park-and-ride vehicle trips is calculated by dividing the number of park-and-ride riders by a 1.05 vehicle occupancy rate (VOR). The number of vehicular drop-off vehicle trips assumes one rider per vehicle.

The intersection levels of service based on the addition of rail-related traffic are shown in Table 4.1-69. There would be no change in LOS under Build conditions at six of the seven signalized intersections analyzed for the Taunton Depot station location. The intersection of Route 140 at Hart Street during the morning and evening peak hours would continue operating at a deficient LOS, declining from LOS E to LOS F. No unsignalized intersections were analyzed for the Taunton Depot Station.

Table 4.1-69 Taunton Depot Station Intersection Capacity Analysis–2030 Build Conditions vs. 2030 No-Build Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	No-Build	Build			No-Build	Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Taunton Depot Station (all alts.)								
Rt. 140 at Hart St.	E	>1.00	>80	F	E	>1.00	>80	F
Rt. 140 at Rt. 24 SB Ramps	B	0.78	17	B	E	>1.00	70	E
Rt. 140 at Rt. 24 NB Ramps	A	0.90	8	A	A	0.72	3	A
Rt. 140 at Taunton Depot Dr.	B	0.56	15	B	B	0.61	22	C
Rt. 140 at Mozzone Blvd.	A	0.44	3	A	C	0.97	26	C
County St at Silver City Galleria Mall driveway/ Rt. 140 Ramps	A	0.09	4	A	A	0.41	8	A
Stevens St. at Rt. 140 NB Ramps	B	0.46	15	B	B	0.58	18	B

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Traffic Operations- Dana Street Station—Dana Street Station is approximately 0.5 mile north of the previously-proposed Downtown Taunton Station and would be served by many of the same roadways that provided access to the Downtown Taunton Station. In addition to the station site relocation, revised ridership projections have been developed, which further change traffic operations. The ridership results show a decrease in proposed auto demand to the station.

Future 2030 ridership projections were developed by the Central Transportation Planning Staff (CTPS) for the previously proposed Downtown Taunton Station. These projections have since been revised to represent a 2035 condition at the proposed Dana Street Station. Table 4.1-70 summarizes the previous and current ridership projections for the two conditions under the Whittenton Alternative. As shown, ridership to the Dana Street station is projected to be between 48 and 63 percent less than was projected for the Downtown Taunton Station.

Table 4.1-70 Downtown Taunton/Dana Street Station Ridership Projection Comparison

Boardings	2030 Downtown Taunton Condition	2035 Dana Street Condition	Difference	Percent Difference
Daily	850	310	-540	-64%
AM Peak	460	240	-220	-48%

Source: CTPS

The reduction in ridership results in reduced vehicle trips to Dana Street station when compared to the Downtown Taunton Station. The reduction in vehicle trips is shown in Table 4.1-71. The DEIS/DEIR presented a full analysis of the Downtown Taunton Station for both the morning and evening peak hours using ridership boarding and alighting information provided by CTPS. Only morning boarding information was provided as part of the current ridership estimates, therefore for the purposes of this analysis it is assumed peak hour trips are the same magnitude (reversed direction) during the morning and evening peak hours.

Table 4.1-71 Downtown Taunton/Dana Street Station Vehicle Trip Comparison

Trips (vph)	2030 Downtown Taunton Station	2035 Dana Street Station	Difference
AM Peak Hour			
Enter	270	130	-140
Exit	44	25	-19
Total	314	155	-159
PM Peak Hour[1]			
Enter	44	25	-19
Exit	270	130	-140
Total	314	155	-159

Source: CTPS
vph vehicles per hour
1 PM data not provided by CTPS; assumed to be reverse impact of AM peak hour.

The vehicle trips related to the proposed Dana Street Station are less than half of the previous estimates; directly attributable to an overall reduction in ridership projected by CTPS. This removes a substantial amount of project-related vehicular traffic from the downtown Taunton area and reduces project impacts related to the station. Although it is projected by CTPS that a higher percentage of riders would drive to a station on Dana Street (69 percent of riders) when compared to Downtown Taunton (44 percent of riders drive), the overall vehicle trips are still substantially lower.

To assess the effects of these changes, a level of service analysis was revised for the intersection of Route 140/Taunton Street at Oak Street, which is the highest-volume intersection in the study area previously defined for the Downtown Taunton Station. As traffic accessing the new Dana Street Station would also likely use this critical intersection, a revised analysis was prepared to assess new impact. Table 4.1-72 presents a comparison of the traffic operations using 2030 Whittenton ridership estimates for Downtown Taunton and 2035 Whittenton ridership estimates for Dana Street.

Table 4.1-72 Downtown Taunton/Dana Street Station Route 140/Taunton Street at Oak Street, Signalized Intersection Traffic Operations

		2030 Downtown Taunton Condition						2035 Dana Street Condition					
		AM Peak			PM Peak			AM Peak			PM Peak		
Location	Lane Group	v/c a	Del b	LOS c	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS
Route 140/	EB LT	0.80	50	D	0.94	78	E	0.71	38	D	0.96	78	E
Tremont Street	EB LT-TH-RT	0.83	54	D	0.97	88	F	0.74	40	D	1.02	95	F
Oak Street/	WB LT-TH-RT	0.84	67	E	1.00	118	F	0.74	49	D	0.92	88	F
Parking Lot	NB LT-TH-RT	0.78	35	C	n/a	n/a	n/a	0.81	39	D	n/a	n/a	n/a
	NB LT[1]	n/a	n/a	n/a	0.51	29	C	n/a	n/a	n/a	0.61	33	C
	NB TH-RT[1]	n/a	n/a	n/a	0.81	40	D	n/a	n/a	n/a	0.59	32	C
	SB LT-TH-RT	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	SB LT-TH	0.81	39	D	>1.2	>120	F	0.64	33	C	0.92	66	E
	SB RT	0.25	9	A	0.34	15	B	0.29	10	B	0.35	16	B
	Overall	0.82	39	D	1.11	75	E	0.77	33	C	0.96	57	E

1 Defacto left-turn during weekday evening peak hour

Given the substantial reduction in ridership between the Downtown Taunton Station and the currently proposed Dana Street Station, traffic operations at the intersection of Route 140/Tremont Street at Oak Street are projected to be improved when compared to the previous analysis. Several intersection movements are still projected to operate at a poor LOS E or LOS F during the 2035 evening peak hour. Although traffic impacts are lower, the mitigation committed to in the DEIS/DEIR would still be recommended because of the proximity of the intersection to the adjacent grade crossing. These measures are described in the mitigation section below.

Traffic Operations-Taunton Station—Table 4.1-73 summarizes the previous (2030) and current (2035) ridership projections for Taunton Station under the Stoughton Electric Alternative. As shown, 2035 ridership estimates at Taunton Station are 72 and 118 percent higher, for total daily and AM peak ridership, respectively, than previous 2030 estimates.

Table 4.1-73 Taunton Station Ridership Projection Comparison

Boardings	2030 Taunton Station	2035 Taunton Station	Difference	Percent Difference
Daily	360	620	260	72%
AM Peak	220	480	260	118%

Source: CTPS

The increase in ridership translates to a corresponding increase in vehicle trips to Taunton Station when compared to the DEIS/DEIR analysis. The revised vehicle trip projections are provided in Table 4.1-74. The DEIS/DEIR presented a full analysis for both the morning and evening peak hours using ridership boarding and alighting information provided by CTPS. Only morning boarding information was provided as part of the December 2012 ridership estimates, therefore for the purposes of this analysis it is assumed peak hour trips are the same magnitude (reversed direction) during the morning and evening peak hours.

Table 4.1-74 Taunton Station Vehicle Trip Comparison

Trips (vph)	2030 Taunton Station	2035 Taunton Station	Difference
AM Peak Hour			
Enter	61	119	58
Exit	37	58	21
Total	98	177	79
PM Peak Hour1			
Enter	23	58	35
Exit	36	119	83
Total	59	177	118

Source: CTPS
vph vehicles per hour
1 PM data not provided by CTPS; assumed to be reverse impact of AM peak hour.

The vehicle trips related to the projected changes in ridership are higher than previous 2030 estimates. This is attributed to an overall increase in ridership projected by CPTS and a projected increase in the percentage of riders who would drive to a station (56 percent of riders) when compared to the DEIS/DEIR analysis (38 percent of riders drive).

To assess the effects of these changes, the DEIS/DEIR level of service analysis was revised for all intersections in the Taunton Station study area. Table 4.1-75 presents a comparison of the 2030 No-Build and 2035 Build traffic operations under the Stoughton Electric Alternative.

Table 4.1-75 Taunton Station Signalized Intersection Traffic Operations–No-Build (2030) versus Build (2035)

Location	2030 No-Build Condition						2035 Taunton Station Build Condition					
	AM Peak			PM Peak			AM Peak			PM Peak		
	v/c [1]	Del [2]	LOS [3]	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS
Signalized Intersections												
Broadway St at	0.75	34	C	0.86	47	D	0.77	37	D	0.92	57	E
Rt. 44 at Dean St./Rte.	0.76	9	A	0.68	11	B	0.78	10	B	0.72	11	B
Rt. 44 at Longmeadow	1.00	>80	F	>1.00	78	E	>1.00	>80	F	>1.00	85	F
Rt. 44 at Arlington St	0.97	43	D	0.99	53	D	0.99	66	E	>1.00	70	E
Main St. at Union St.	0.92	33	C	0.88	30	C	0.96	40	D	0.91	36	D
Spring St at Summer St (Rt. 140)	0.70	26	C	0.80	27	C	0.73	26	C	0.80	27	C
Rt. 140 at Hon. Gordon Owen Riverway	0.75	16	B	0.95	41	D	0.77	17	B	0.97	47	D
Unsignalized Intersections	Critical Movement	Del[4]	LOS	Critical Movement	Del	LOS	Critical Movement	Del	LOS	Critical Movement	Del	LOS
Arlington St at School St	School NB	20	C	School NB	30	D	School NB	22	C	School NB	39	E
Washington St at Purchase St	Washington SB	25	C	Washington NB	>50	F	Washington SB	34	D	Washington NB	>50	F
School St at Winter St	School SB	>50	F	School SB	>50	F	School SB	>50	F	School SB	>5	F
Arlington St at Taunton Station Driveway	NA	NA	NA	NA	NA	NA	Driveway WB Left	15	C	Driveway WB Left	21	C

Source: Synchro 7.0 Software; Build 763
1 volume-to-capacity ratio
2 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
3 level of service
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; NA = Not Applicable

The overall results of the level of service analysis are generally the same as presented in the DEIS/DEIR. Mitigation measures are required to offset project related impacts and are described in the mitigation section below. One location, Arlington Street at School Street (where mitigation was not previously recommended), shows project-related impacts that affect level of service such that mitigation is now required.

When compared to the DEIS/DEIR delay and level of service results, the intersection of Dean Street at Longmeadow Street realizes a small increase in delay (10 additional seconds during the morning peak hour and five additional seconds during the evening peak hour).

Traffic Signal Warrants—Two intersections were evaluated against the traffic signal warrant for the peak hour period:

- Washington Street at Frederick Martin Parkway
- Arlington Street at Taunton Station Driveway

The intersection of Washington Street at Frederick Martin Parkway meets the requirements set forth by the MUTCD for traffic signal installation based on future peak hour traffic volumes.

The Arlington Street at Taunton Station Driveway intersection does not meet peak hour traffic signal warrants based on the projected future traffic volumes.

Pedestrians and Bicycles—The travel demand and ridership estimates completed by CTPS indicate that about 80 trips would access Taunton Depot Station (all alternatives) on foot or by bicycle on a daily basis, which would increase pedestrian and bicycle activity in the vicinity of Route 140 and Hart Street. At Dana Street Station (Whittenton Alternatives), approximately 50 pedestrian/bicycle trips would be expected and at Taunton Station about 230 pedestrian/bike trips would be expected. Increased pedestrian and bicycle demands at either of these stations would be realized in the vicinity of Downtown Taunton, particularly along Route 44, Route 138, Oak Street and/or Arlington Street. The majority of the infrastructure needed to support pedestrian and bicycle access to the proposed stations exists currently and would not be adversely impacted by the change in number of pedestrians on study area roadways.

To accommodate pedestrian demand related to Taunton Depot Station, a sidewalk would be required within the Target shopping center. The sidewalk is necessary to delineate the pedestrian right-of-way from Route 140 to the station platform. To accommodate pedestrian demand related to Taunton Station (Stoughton Alternative) traffic signal timing and phasing changes would be required at the intersection of Dean Street and Longmeadow Street. A high visibility crosswalk with a passive flashing pedestrian crossing sign would also be needed. Finally, to support Downtown Taunton pedestrian demands, a number of traffic signal timing adjustments would be needed. These adjustments would occur at the intersections of:

- Weir Street at Broadway
- Washington Street at Court Street
- Washington Street at Fredrick Martin Boulevard
- Washington Street at Tremont Street

These mitigation measures are discussed further below in Section 4.1.5, *Mitigation Measures*.

Neither of the proposed station locations would physically alter designated bicycle facilities nor disrupt future plans for either on-road or off-road facilities in the study area. To accommodate demand, bicycle parking and storage locations would be maximized using available space.

Parking—The Taunton Depot Station (both rail alternatives) is proposed to have 442 parking spaces (eight of these handicapped accessible). An additional 14 parking spaces would be reserved for drop-off activity.

Dana Street Station (Whittenton Alternatives) would have 477 spaces (9 of which are handicapped accessible).

Two hundred and nine (209) spaces are proposed at Taunton Station (Stoughton Alternative), including seven that are handicapped accessible. The Build Alternatives would not physically alter the existing public parking supply or impact parking availability within Taunton. Based on the projected daily park-and-ride ridership, the parking supply at each station would be sufficient to meet the peak parking demand for 320, 590, 120 spaces, respectively.

Relocated Stoughton Station Transportation Impacts

Under the Stoughton and Whittenton Alternatives, the existing railroad tracks for the Stoughton Station will be realigned and the station platform will be relocated south to the site bounded to the north by Wyman Street, west by Morton Street, and south by Brock Street. The relocated station will have two driveways: a north driveway off of Morton Street, and a south driveway off of Brock Street. As part of the station relocation, parking will be consolidated to one parking lot and increased up to 701 parking spaces, which includes 6 kiss-and-ride spaces and 17 handicap spaces.

The following sections present the transportation analysis associated with the relocation of Stoughton Station and the increase in available parking. In general, traffic conditions would improve as a result of relocating the Stoughton Station.

Station Trip Generation and Redistribution—All station-related vehicle trips were redistributed to the new driveways and throughout the roadway network for the Build Condition analysis. New vehicle trips, generated by either the expanded service or increase in available parking, were then added to the redistributed traffic volume network to create the Build Condition traffic volume networks depicted in Figures 4.1-64 and 4.1-65. Table 4.1-76 presents the projected number of new vehicle trips expected under the Build Condition.

Table 4.1-76 Relocated Stoughton Station Projected New Vehicle Trips

	Morning Peak Hour		Evening Peak Hour	
Type of Trip	In	Out	In	Out
Park-and-Ride	46	11	12	52
Kiss-and-Ride	-10	1	0	-5

As shown in Table 4.1-76, the number of kiss-and-ride trips would decrease relative to the No-Build condition. This can be attributed to a shift in the mode of access by riders. With the expansion of service, some riders currently boarding in Stoughton would board farther south, eliminating the need to be dropped off at the station. Other riders who are currently dropped off would shift to park-and-ride, as the available parking will increase under the Build Condition.

Traffic Operations Analysis—The Build Condition traffic operation analyses are shown in Table 4.1-77 through Table 4.1-79.

Table 4.1-77 Relocated Stoughton Station Signalized Intersection Capacity Analysis

		No-Build Condition			Build Condition		
Location	**Period**	**v/c [1]**	**Delay [2]**	**LOS [3]**	**v/c [1]**	**Delay [2]**	**LOS [3]**
Porter Street at Washington Street(Route 138)	Weekday Morning	0.73	22	C	0.68	20	C
	Weekday Evening	0.94	60	E	0.88	53	D
Pleasant Street at Park Street (Route 27)	Weekday Morning	0.96	45	D	0.92	36	D
Washington Street (Route 138)	Weekday Evening	0.83	27	C	0.78	24	C

Source: Synchro 7 (Build 773, Rev 8) software
1 volume-to-capacity ratio
2 average delay in seconds per vehicle
3 level of service

As discussed above, relocating Stoughton Station parking would redistribute station related traffic through study area intersections. A portion of traffic would access the parking lot driveway at Brock Street and no longer travel through Stoughton Center. As a result, the delay for the signalized intersections would improve slightly. The level of service at the intersection of Porter Street at Washington Street would improve from LOS E to LOS D. Complete traffic operations analysis results are provided in Appendix 4.1-K.

Relocating Stoughton Station would also eliminate the existing MBTA Lot Driveway on Wyman Street and substantially reduce or eliminate traffic at the Trackside Plaza South Driveway, eliminating most vehicle conflicts at this location. Level of service results for this intersection are not provided in Tables 4.1-78 and 4.1-79 since no delay would occur. Field observations indicate that traffic is currently using the Trackside Plaza South Driveway to access the station, while patrons of Trackside Plaza businesses use other driveways on Summer Street and Canton Street.

At the intersection of Brock Street at Washington Street, the demand for the eastbound Brock Street and westbound Kinsley Street approaches would increase substantially. The eastbound Brock Street approach and westbound Kinsley Street approach would deteriorate from LOS E to LOS F and LOS D to LOS F, respectively, during the morning peak hour. During the evening peak hour, the eastbound and westbound approach would continue to operate deficiently at LOS F.

Table 4.1-78 Relocated Stoughton Station Unsignalized Intersection Capacity Analysis (Morning Peak Hour)

		No-Build Condition				Build Condition			
Location	Critical Movement	Demand[1]	v/c [2]	Delay[3]	LOS[4]	Demand	v/c	Delay	LOS
Porter Street at Washington Street	WB RT	15	0.07	15	B	15	0.07	15	B
Freeman Street at Washington Street	WB RT	10	0.22	63	F	10	0.19	52	F
Wyman Street at Washington Street	EB RT	130	0.35	17	C	115	0.29	15	C
Summer Street at Wyman Street	EB LT-RT	33	0.04	9	A	50	0.05	9	A
Brock Street at Washington Street	EB LT-TH-RT	125	0.70	50	E	285	>1.20	>120	F
	WB LT-TH-RT	50	0.36	34	D	100	>1.20	>120	F
	NB LT-TH-RT	435	0.15	4	A	440	0.17	5	A
	SB LT-TH-RT	365	0	0	A	355	0.0	1	A
Brock Street at Morton Street	EB LT-TH-RT	65	0.12	9	A	70	0.12	9	A
	WB LT-TH-RT	215	0.40	11	B	190	0.36	11	B
	NB LT-TH-RT	237	0.46	12	B	260	0.50	13	B
	SB LT-TH-RT	82	0.17	10	A	75	0.16	9	A
Brock Street at Wyman Street	WB LT-RT	100	0.14	10	A	100	0.14	10	A
Park Avenue/Sumner Street at Park Street	EB LT	215	>1.20	>120	F	215	>1.20	>120	F
	EB TH-RT	15	0.06	17	C	5	0.06	17	C
	WB LT-TH-RT	20	0.10	22	C	20	0.10	23	C
MBTA North Driveway at Morton Street	WB LT-RT		Does not exist			85	0.13	11	B
MBTA South Driveway at Brock Street	SB LT-RT		Does not exist			160	0.30	14	B

Source: Synchro 7 (Build 773, Rev 8) software
Note: Shaded cells denote LOS E/F conditions.
1 demand in vehicles per hour for unsignalized intersections
2 volume-to-capacity ratio for the critical movement, values over 1.0 indicate demand in excess of capacity.
3 Control delay per vehicle, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
4 level of service of the critical movement
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = left-turn; TH = through; RT = right-turn; Neg = negligible; N/A = not applicable

Table 4.1-79 Relocated Stoughton Station Unsignalized Intersection Capacity Analysis (Evening Peak Hour)

Location	Critical Movement	No-Build Condition Demand[1]	v/c[2]	Delay[3]	LOS[4]	Build Condition Demand	v/c	Delay	LOS
Porter Street at Washington Street	WB RT	25	0.08	13	B	25	0.08	13	B
Freeman Street at Washington Street	WB RT	15	0.14	32	D	15	0.12	27	D
Wyman Street at Washington Street	EB RT	140	0.50	26	D	90	0.32	20	C
Summer Street at Wyman Street	EB LT-RT	70	0.08	9	A	85	0.10	10	A
Brock Street at Washington Street	EB LT-TH-RT	155	>1.20	>120	F	295	>1.20	>120	F
	WB LT-TH-RT	70	>1.20	>120	F	115	>1.20	>120	F
	NB LT-TH-RT	490	0.10	3	A	490	0.13	4	A
	SB LT-TH-RT	820	0.01	0	A	810	0.01	1	A
Brock Street at Morton Street	EB LT-TH-RT	80	0.13	9	A	80	0.14	9	A
	WB LT-TH-RT	170	0.31	10	B	170	0.32	11	B
	NB LT-TH-RT	97	0.19	9	A	105	0.21	9	A
	SB LT-TH-RT	165	0.32	10	B	180	0.35	11	B
Brock Street at Wyman Street	WB LT-RT	120	0.16	9	A	125	0.16	9	A
Park Avenue/Sumner Street at Park Street	EB LT	125	>1.20	>120	F	125	>1.20	>120	F
	EB TH-RT	25	0.11	19	C	25	0.11	19	C
	WB LT-TH-RT	50	0.28	25	D	50	0.29	26	D
MBTA North Driveway at Morton Street	WB LT-RT	Does not exist				155	0.23	11	B
MBTA South Driveway at Brock Street	SB LT-RT	Does not exist				150	0.26	13	B

Source: Synchro 7 (Build 773, Rev 8) software
Note: Shaded cells denote LOS E/F conditions.
1 demand in vehicles per hour for unsignalized intersections
2 volume-to-capacity ratio for the critical movement, values over 1.0 indicate demand in excess of capacity.
3 Control delay per vehicle, expressed in seconds, includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.
4 level of service of the critical movement
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = left-turn; TH = through; RT = right-turn; Neg = negligible; N/A = not applicable

Queue Analysis- A queue analysis was conducted to compare the queues at signalized study area intersections under the No-Build Condition and the Build Condition. Table 4.1-80 presents the results of the analysis; complete results are provided in Appendix 4.1-K.

Table 4.1-80 Relocated Stoughton Station Vehicle Queue Analysis

Location	Lane Group	Available Storage Length (feet)	95th Percentile Queue[1] No-Build Condition Morning Peak Hour	No-Build Condition Evening Peak Hour	Build Condition Morning Peak Hour	Build Condition Evening Peak Hour
Porter Street at	EB RT	250	199	373	84	310
Washington Street	NB LT-LT	125	508	513	422	420
	NB TH	135	243	123	243	123
	SB TH	365	#316	859	#338	#886
	SEB RT-RT	650	#271	#277	#247	#277
Pleasant Street at Park Street/	NB TH-TH-RT	215	#447	#355	#418	#323
Washington Street	SB LT	110	#308	#228	#266	#202
	SB TH	130	#630	#715	#500	#637
	SB RT	165	63	151	61	149
	NE LT-TH	845	#456	287	#462	287
	SW RT	340	0	0	0	0

Source: Synchro 7 (Build 773, Rev 8) software
Note:
1 95th percentile queue length in feet
# 95th percentile volume exceeds capacity; queue may be longer.
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = left-turn; RT = right-turn

When compared to the No-Build Condition, queue lengths for the Build Condition would be noticeably shorter at the intersection of Porter Street at Washington Street: for the eastbound Porter Street right-turn lane during the evening peak hour and for the northbound Washington Street left-turn lane during both morning and evening peak hours.

At the intersection of Pleasant Street at Park Street/Washington Street, northbound Park Street queue lengths would be noticeably shorter during the morning and evening peak hours. The reduction in queue lengths is attributed to the redistribution in traffic on study area roadways that would result from relocating the Stoughton Station.

Pedestrians and Bicycles-The travel demand and ridership estimates completed by CTPS indicate that approximately 220 additional pedestrians/bicycle trips would be expected daily under the Build Condition. With the relocation of Stoughton Station, pedestrians will likely access the station via Morton Street, Brock Street and Washington Street. Currently, sidewalks are provided on the east side of Morton Street, north side of Brock Street and along both sides of Washington Street. The majority of the infrastructure needed to support pedestrian and bicycle access to the proposed station exists currently and would not be adversely impacted by the change in the number of pedestrians within the study area.

Signal Warrant Analysis- A signal warrant analysis was conducted to determine whether a traffic signal should be installed at the intersection of Washington Street at Brock Street. This intersection is expected

to see a substantial increase in traffic volume due to relocating the Stoughton Station. The analysis showed that a signal is warranted at this intersection due to traffic volume.

Easton Transportation Impacts (Stoughton and Whittenton Alternatives)

There are two stations planned in Easton:

- North Easton, which would be located on the Stoughton town line off Roche Bros Way
- Easton Village, which would be located off Sullivan Street just south of Oliver Street

Access to the proposed North Easton Station would be via the existing signalized Roche Brothers Shopping Center driveway located on Route 138 just south of the Stoughton town line. This driveway would serve vehicular and bicycle users. A sidewalk would be constructed along the access road to provide access for pedestrians.

At Easton Village, access to the proposed station would be provided via a drop-off loop on Sullivan Street. No parking is proposed for this station. Pedestrian and bicycle access would be provided via Sullivan Street and Oliver Street.

Traffic Operations—Design year (2030) Build condition traffic volumes for the study area roadways were determined by estimating site-generated traffic volumes and distributing these volumes over study area roadways within Easton. These site generated volumes were added to the No-Build traffic volumes to create the 2030 Build condition traffic volume networks, which are depicted in Figures 4.1-66 and 4.1-67.

The projected number of vehicle trips in and out of the North Easton and Easton Village stations during the morning and evening peak hours are shown in Table 4.1-81. No park-and-ride trips are projected at Easton Village because no commuter parking is planned for that station, however 12 spots will be dedicated for kiss & ride accommodations within an existing private lot. The trip generation for the North Easton station is based on projected ridership on the Stoughton Alternative.

Table 4.1-81 Park-and-Ride and Vehicular Drop-Off Vehicle Trips:[1] Easton Stations (Stoughton and Whittenton Alternatives)

		Morning Peak Hour		Evening Peak Hour	
Station	**Type of Trip**	**In**	**Out**	**In**	**Out**
North Easton	Park-and-Ride	239	31	27	234
	Drop-off	27	27	26	26
	Total Vehicles	266	58	53	260
Easton Village	Park-and-Ride	0	0	0	0
	Drop-off	44	44	32	32
	Total Vehicles	44	44	32	32

1 The number of park-and-ride vehicle trips is calculated by dividing the number of park-and-ride riders by a 1.05 vehicle occupancy rate (VOR). The number of drop-off vehicle trips assumes one rider per vehicle.

The directional distribution of station-generated traffic is a function of population distribution, vehicle-owning households, existing travel patterns on area roadways, and traffic conditions. The trip distribution for the park-and-ride trips associated with North Easton Station is based on ridership data

provided by CTPS, which take into account these factors. Table 4.1-82 provides the geographic distribution of these trips.

Table 4.1-82 Easton Trip Distribution (Stoughton and Whittenton Alternatives)

To/From	Distribution
North	25%
South	18%
East	25%
West	32%

Source: CTPS Travel Demand Model.

The park-and-ride traffic was distributed to the study area roadways based on these percentages. Drop-off traffic was added separately and is based on existing travel patterns on area roadways near the proposed station locations. Only drop-off traffic was generated by Easton Village Station.

The intersection levels of service based on the addition of rail related traffic are shown in Table 4.1-83.

Table 4.1-83 Easton Intersection Capacity Analysis –2030 Build Conditions vs. 2030 No-Build Conditions (Stoughton and Whittenton Alternatives)

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	No-Build	Build			No-Build	Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS[1]	V/C	Delay	LOS
North Easton Station								
Rt. 138 at Roche Bros. Way	B	0.98	38	D	B	0.76	21	C
Rt. 138 at Main St.	F	>1.00	>80	F	E	>1.00	74	E
Easton Village Station								
Rt. 138 at Belmont St. (Rt. 123)	D	0.90	67	E	F	>1.00	>80	F
Rt. 138 at Roosevelt Circle	A	0.66	7	A	B	0.84	20	B
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
North Easton Station								
Rt. 138 at Elm St.	F	Elm WB All	>50	F	F	Elm WB All	>50	F
Rt. 138 at Union St.	F	Union WB L/R	>50	F	F	Union WB L/R	>50	F
Easton Village Station								
Elm St. at Main St	B	Elm WB L/R	14	B	B	Elm WB L/R	18	C
Center St. at Main St. at Lincoln St.	F	Center NB All	>50	F	F	Center NB All	>50	F
Lincoln St. at Barrows St.	B	Barrows NB All	12	B	D	Barrows NB All	>50	F

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Two signalized and two unsignalized locations were analyzed for the North Easton station under Build conditions. The signalized intersection of Roche Bros Way and Route 138, which provides access to the train station, would operate at acceptable levels of service during both the morning and evening peak hours. The other three locations would operate at LOS E or F. Two signalized and three unsignalized locations were analyzed for the Easton Village station. The signalized intersection of Route 138 at Belmont Street would decline to a deficient LOS, from LOS D to LOS E, during the morning peak hour and remain at LOS F during the evening peak hour. Only one change in LOS is expected at the unsignalized locations; Lincoln Street at Barrows Street is expected to become deficient, declining from LOS D under No-Build to LOS F for Build conditions.

Traffic Signal Warrants—Three intersections were evaluated against the traffic signal warrant for the peak hour period:

- Route 138 at Elm Street
- Route 138 at Union Street
- Main Street at Center Street

The intersections of Route 138 at Elm Street and Route 138 at Union Street meet the requirements set forth by the MUTCD for traffic signal installation based on future peak hour traffic volumes.

The Main Street at Center Street intersection is projected to meet peak hour traffic signal warrants with or without the South Coast Rail project. With the adjacent historic Rockery, a Civil War memorial, a traffic signal system with the required lane configurations cannot be installed, as impacts to the historic property could not be avoided.

Pedestrians and Bicycles—The travel demand and ridership estimates completed by CTPS indicate that about 180 pedestrian/bicycle trips would access North Easton Station (Stoughton and Whittenton Alternatives) on a daily basis, which would increase pedestrian and bicycle activity in the vicinity of Route 138. At Easton Village Station (Stoughton and Whittenton Alternatives), approximately 240 pedestrian/bicycle trips would be expected. The majority of the infrastructure needed to support pedestrian and bicycle access to both proposed stations exists currently and would not be adversely impacted by the change in number of pedestrians on study area roadways.

The intersections of Route 138 at Elm Street and Route 138 at Union Street meet the requirements set forth by the MUTCD for traffic signal installation based on future peak hour traffic volumes.

The Main Street at Center Street intersection is projected to meet peak hour traffic signal warrants with or without the South Coast Rail project. With the adjacent historic Rockery, a Civil War memorial, a traffic signal system with the required lane configurations cannot be installed, as impacts to the historic property could not be avoided.

Traffic signal timing and phasing changes would be required at the North Easton Station driveway intersection with Route 138 to accommodate pedestrian demands. Pedestrian phases would also be included at the newly signalized intersections of Route 138 at Elm Street and Route 138 at Union Street. These changes are discussed further in Section 4.1.5, Mitigation Measures.

To accommodate increased pedestrian demand at Easton Village Station, crosswalks would be restriped at the intersections of Main Street at Center Street, Lincoln Street at Barrows Street, and Main Street at Barrows Street. At the Main Street at Center Street intersection, a high visibility crosswalk with a passive flashing pedestrian crossing sign would also be installed at the Main Street crosswalk. Sidewalks and crosswalks elsewhere in the vicinity of Easton Village Station are adequate to handle the expected demand.

Neither of the proposed station locations would physically alter designated bicycle facilities nor disrupt future plans for either on-road or off-road facilities in the study area. To accommodate demand, bicycle parking and storage locations would be maximized using available space.

Parking—The North Easton Station (Stoughton and Whittenton Alternatives) is proposed to have 509 parking spaces (12 of these handicapped accessible). The proposed project would not physically alter the existing public parking supply or impact parking availability within Easton in the vicinity of the North Easton Station. Based on the projected daily park-and-ride trips, the peak parking demand for North Easton Station is 520 spaces.

Ten vehicular drop-off parking spaces are proposed at Easton Village Station (Stoughton and Whittenton Alternatives). These parking spaces would be shared with the Easton Historical Society. The existing on-street parking supply in the vicinity of Easton Village is vulnerable to unauthorized use by commuters. Parking limit signage and increased enforcement may be needed to ensure parking is being properly utilized.

Raynham Transportation Impacts (Stoughton and Whittenton Alternatives)

The Raynham Park Station site (Stoughton and Whittenton Alternatives) is west of Route 138 just south of the Raynham-Taunton Greyhound Park. Access for all users would be provided via a newly signalized intersection with Robinson Road. Robinson Road would be realigned slightly to the north to create a four-way intersection with the station driveway.

Traffic Operations—Design year (2030) Build condition traffic volumes for the study area roadways were determined by estimating site-generated traffic volumes and distributing these volumes over study area roadways within Raynham. These site-generated volumes were added to the No-Build traffic volumes to create the 2030 Build condition traffic volume networks, which are shown in Figures 4.1-68 and 4.1-69.

The projected number of vehicle trips in and out of the Raynham Park Station (Stoughton and Whittenton Alternatives) during the morning and evening peak hours is shown in Table 4.1-84. The trip generation for this station is based on ridership projections for the Whittenton Alternative which generates the highest ridership projections for the Raynham Park Station.

The directional distribution of station-generated traffic is a function of population distribution, vehicle-owning households, existing travel patterns on area roadways, and traffic conditions. The trip distribution for the park-and-ride trips associated with the Raynham Park Station is based on ridership data provided by CTPS, which take into account these factors. Table 4.1-85 provides the geographic distribution of these trips.

Table 4.1-84 Park-and-Ride and Drop-off Vehicle Trips:[1] Raynham Park Station (Stoughton and Whittenton Alternatives)

		Morning Peak Hour		Evening Peak Hour	
Station	Type of Trip	In	Out	In	Out
Raynham	Park-and-Ride	183	21	17	166
	Drop-off	32	32	25	25
	Total Vehicles	215	53	42	191

1 The number of park-and-ride vehicle trips is calculated by dividing the number of park-and-ride riders by a 1.05 vehicle occupancy rate (VOR). The number of drop-off vehicle trips assumes one rider per vehicle.

Table 4.1-85 Raynham Park Station Trip Distribution (Stoughton and Whittenton Alternatives)

To/From	Distribution
North	5%
South	31%
East	15%
West	49%

Source: CTPS Travel Demand Model.

The park-and-ride traffic was distributed to the study area roadways based on these percentages. Drop-off traffic was added separately and is based on existing travel patterns on area roadways near the proposed station locations.

The intersection levels of service based on the addition of rail related traffic are shown in Table 4.1-86. All six signalized intersections would continue to operate at acceptable levels of service under Build conditions. There would be no change in levels of service at two of the three unsignalized intersections. During the morning peak hour, the intersection of Route 138 at Wilbur Street would decline from LOS E under No-Build to LOS F. Operations during the evening would remain unchanged. The unsignalized intersection of the existing driveway with Route 138, which would also serve as the station driveway, would continue to operate at LOS F. The operational discussion of the proposed traffic signal at Route 138 and Robinson Street/Station Driveway is discussed in Section 4.1.5, Mitigation Measures.

Table 4.1-86 Raynham Park Station Intersection Capacity Analysis–2030 Build Conditions vs. 2030 No-Build Conditions (Stoughton and Whittenton Alternatives)

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	No-Build	Build			No-Build	Build		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Raynham Park Station (Stoughton and Whittenton Alternatives)								
Rt. 138 at Rt. 106 (Foundry St., Easton)	C	0.92	27	C	D	>1.00	48	D
Rt. 138 at Elm St.	B	0.80	20	C	B	0.82	18	B
Rt. 138 at I-495 NB Ramps	B	0.70	16	B	B	0.86	19	B
Rt. 138 at I-495 SB Ramps	C	0.98	37	D	B	0.72	16	B
Rt. 138 at Carver St.	C	0.90	23	C	D	>1.00	50	D
Rt. 138 at Center St.	A	0.61	9	A	C	0.96	24	C
Unsignalized Intersections	LOS	Critical Movement	Delay[4]	LOS	LOS	Critical Movement	Delay	LOS
Raynham Park Station (Stoughton and Whittenton Alternatives)								
Rt. 138 at Wilbur St.	E	Wilbur WB L/R	>50	F	E	Wilbur WB L/R	47	E
Rt. 138 at Britton St. (East)	F	Britton WB L/R	>50	F	F	Britton WB L/R	>50	F
Rt. 138 at Britton St. (West)	F	Britton EB L/R	>50	F	F	Britton EB L/R	>50	F
Rt. 138 at Robinson St.	D	Robinson WB L/R	40	E	B	Robinson WB L/R	13	B
Rt. 138 at Dog Track Driveway	D	Driveway EB L/R	>50	F	E	Driveway EB L/R	>50	F

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 average control delay for the critical movement, rounded to the nearest whole second, for unsignalized intersections
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Traffic Signal Warrants—Two intersections for the Raynham Park Station (Stoughton and Whittenton Alternatives) were evaluated against the traffic signal warrant for the peak hour period:

- Route 138 at Station Driveway
- Route 138 at Wilbur Street

The intersection of Route 138 at the proposed Station Driveway meets the requirements set forth by the MUTCD for traffic signal installation based on future peak hour traffic volumes. The Route 138 at Wilbur Street intersection does not meet peak hour traffic signal warrants based on the projected future traffic volumes.

Pedestrians and Bicycles—The travel demand and ridership estimates completed by CTPS indicate that about 140 pedestrian/bicycle trips would access Raynham Park Station (Stoughton and Whittenton Alternatives) on a daily basis, which would increase pedestrian activity along Route 138 and within the neighborhood to the east of Route 138. To accommodate pedestrian demands, a pedestrian phase would be incorporated into the signalized station driveway entrance to the site. Installation of this signal also requires the realignment of Robinson Street slightly to the north. It is expected that the crossing

and roadway realignment would encourage the use of Robinson Street, a low volume roadway, as a pedestrian route rather than the more congested Route 138.

The proposed station location would not physically alter designated bicycle facilities or disrupt future plans for either on-road or off-road facilities in the study area. To accommodate demand, bicycle parking and storage locations would be maximized using available space.

Parking—Raynham Park Station (Stoughton and Whittenton Alternatives) is proposed to have 448 parking spaces (of which eight would be handicapped accessible). An additional seven parking spaces would be reserved for drop-off activity. The proposed project would not physically alter the existing public parking supply or impact parking availability within Raynham. Based on the projected daily park-and-ride ridership, the parking supply would be sufficient to meet the peak parking demand for 400 spaces.

Layover Facilities

The proposed overnight layover facilities would only generate traffic associated with MBTA personnel. Due to the low number of trips anticipated, any impacts on traffic would be negligible and do not warrant detailed analysis.

Temporary Construction Impacts

The Build Alternatives have the potential to cause temporary disruptions in local access and mobility during the construction period as a result of temporary street closures and detours. Temporary street closures could be required to make improvements to the grade-crossings, such as new crossing gates, modifications to intersections and construction of stations. Construction activities would also generate additional traffic related to construction employee commutes, and the transport of materials and equipment by truck. As part of that phase, MassDOT will develop transportation management plans to detour traffic around construction areas. These transportation management plans will be closely coordinated with the cities and towns affected by each construction element, including emergency response representatives. A robust outreach program would be developed, notifying the public of construction activities through telephone calls, email blasts, website notices, and flyer distributions. Public information meetings would be conducted, identifying bridge construction and roadway closure locations, intersection construction activities, construction schedules, and temporary traffic, safety, and pedestrian detours through construction areas. For additional information on the construction staging plans, refer to Appendix 3.2-F.

4.1.5 Mitigation Measures

This section discusses safety and mitigation measures associated with grade crossing impacts. In addition, the LOS results completed as part of the Build impact analysis identify locations where the proposed stations are likely to cause traffic operations on the local roadway network to degrade. Specific mitigation measures that could be undertaken by MassDOT, as discussed below, were developed to offset these impacts and ensure adequate access to the proposed stations. In the case where structural changes to the roadway and traffic control devices are proposed, the mitigation aims to improve traffic flow with minimal impacts to adjacent land uses and at reasonable cost. The benefit of these changes is noted in the discussions below. The traffic mitigation measures are presented by municipality and station.

4.1.5.1 Grade Crossings

The following components and characteristics are being considered to optimize safety at the proposed South Coast Rail at-grade crossings:

- **Vehicle Type and Condition**. At-grade crossings would be designed to anticipate different vehicle types (passenger cars, trucks, buses). All rail vehicles would be required to undergo frequent inspection programs to ensure each vehicle in active service is maintained to meet current safety standards in an effort to remove the possibility of equipment or materials falling off the vehicles at grade crossings, or the vehicles from breaking down in an at-grade crossing.

- **Geometry**. At-grade crossings would be designed with minimum curvature or profile changes to allow for optimal sight lines, allowing drivers more time to safely stop before the crossing. Some existing at-grade crossings would be closed in some locations to optimize safety, as noted in Section 4.1.4, Proposed At-Grade Crossings.

- **Signage and Markings**. All traffic control devices (such as highway signage, markings and devices, etc.) would be designed in compliance with the MUTCD[16]. Signs and markings would be placed a sufficient distance from the crossings to allow adequate warning to motorists and pedestrians.

- **Crossing Surface**. The condition of the roadway in the vicinity of the at-grade crossing and the condition of the track would be maintained at existing standards by maintaining the road surface and rail seal.

- **Site Conditions.** Physical obstructions in the vicinity of each crossing, such as trees and vegetation, buildings, signal cases and bungalows, signs, hills, fences, walls and parked vehicles, would be minimized or eliminated to provide drivers with optimal sight lines.

- **Illumination.** Visibility of the train and the general visibility of an at-grade crossing are important elements that would be considered. Methods for illumination would include lights and reflectorization of the train, and/or lighting at the at-grade crossings (i.e. street lights).

- **Traffic Signal Preemption.** Where a signalized intersection is located within 200 feet of an at-grade crossing, traffic signal preemption would be used to ensure that vehicle queues are cleared in advance of the train.

- **Signals and Operations.** A traditional at-grade crossing is made up of several types of warning devices. A bell serves as an audible warning that the gates would begin their downward track. At the same time the bell is initiated, the flashers both on the flasher pole and the gate arm are activated. This is a visual warning for the motorist that the gates would begin their descent. The MUTCD requires a minimum of 20 seconds of warning time at at-grade crossings. Both of these would be used to ensure proper visual and audible warnings for motorists.

[16] US Department of Transportation. Federal Highway Transportation. *Manual on Uniform Traffic Control Devices for Street and Highways*. May 2012. Web. Apr.-May 2012. <http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf>

- **Gated Warning Devices.** Commonly used throughout the country. The gates are made out of a fiberglass resin, which is designed to break away should emergency vehicles or other vehicles need to drive through the gates. Gated crossings are typically outfitted with flasher units and bells for visual and audible warning devices.

- **Gate Timing.** Traditionally, railroad and transit agencies allow for 30 seconds of warning time, an additional 10 seconds over the MUTCD's requirements. This is generally due to varying conditions at an at-grade crossing, including gate lengths, wind conditions, weather condition and varying maintainer adjustments. This allowance would be used at at-grade crossings for the South Coast Rail project.

- **Vital Logic.** Vital railroad signal logic, equipment that identifies the train speed and location through circuitry in the rails and onboard computers in the locomotive, would be used at at-grade crossings to identify the direction of an approaching train, identify any hazards in the crossing, and create a failsafe that would close the gates automatically in the event of an emergency.

- **AHCW Systems.** Each proposed public and private at-grade crossing would be suitable for public use if equipped with a combination of new, state-of-the-art, Automatic Highway Crossing Warning (AHCW) systems and designed with minor geometric modifications (such as driveway reconfiguration, driveway closures, vegetation clearing and utility pole relocations). The advanced warning system would communicate with the MBTA Operational Control Center (OCC) and would allow MBTA train dispatchers to communicate with and receive indications directly from each at-grade crossing.

- **General Safety Enhancements.** Recommended at all South Coast Rail at-grade crossings that are proposed to remain active. These measures include:

  - Remove gates and signals at existing crossings and replace them with new gates, signals, and signal cases;

  - Remove vegetation at all at-grade crossings to improve sight distance;

  - Evaluate the need for guardrails at each location during final design; and

  - Evaluate the need to remove or relocate utility poles, walls, boulders and fences during final design.

In addition to the general improvements listed above, additional site specific improvements are recommended. These improvements range from minor (installing traffic signal pre-emption at existing intersections) to major construction (potential at-grade separation). These recommended improvements are summarized in Table 4.1-87 and briefly described subsequently.

Table 4.1-87 Stoughton Alternatives Proposed At-Grade Crossing Improvements

Town/City	Street	Recommended At-Grade Crossing Safety Improvements
STOUGHTON LINE		
Canton	Washington Street	Install a traffic signal pre-emption system at two intersections in proximity of the crossing
	Pine Street	Relocate existing driveway to the north
	Will Drive	General improvements
Stoughton	Central Street	Relocate existing driveway to the west
		Coordinate crossing operation with fire station located 400 feet west
		Extend sidewalk through the crossing
		Install crosswalk across the Central Street eastbound approach to the crossing
	Simpson Street	General improvements
	School Street	Modify alignment at Cushing Street
	Porter Street (Route 27)	General improvements
	Wyman Street	Reconfigure parking lot and driveway
	Brock Street	Investigate installation of a traffic signal with pre-emption system at nearby intersection
		Reconfigure driveway to the east and relocate driveway to the west
	Plain Street	Investigate installation of a traffic signal with pre-emption system at nearby intersection
		Relocate driveways to the east
	Morton Street	Close Morton Street
		Construct frontage road to Totham Farm Road
Easton	Elm Street	Relocate driveway to the east
	Oliver Street	Relocate driveways to the northwest
		Relocate children’s play area
		Extend sidewalk through crossing
	Gary Lane	Install gates and locks
	Short Street	General improvements
	Depot Street (Route 123)	Reconfigure driveway to the west
	Purchase Street	General improvements
	Prospect Street	General improvements
	Foundry Street (Route 106)	General improvements
Raynham	Race Track Crossing	General improvements
	Elm Street	General improvements
	Carver Street	Reconstruct culvert
	Broadway (Route 138)	At-grade separation
	Britton Street	General improvements
	King Philip Street	Relocate driveways
	East Britannia Street	General improvements
Taunton	Longmeadow Road	Reconfigure or close driveways
	Dean Street (Route 44)	Reconstruct Dean Street/Arlington Street traffic signal system
		Install traffic pre-emption phasing at Dean Street/Arlington Street
NEW BEDFORD MAIN LINE		
	Ingell Street	Close driveway to the west

Town/City	Street	Recommended At-Grade Crossing Safety Improvements
	Hart Street	General improvements
Berkley	Cotley Street	General improvements
	Padelford Street	General improvements
	Myricks Street (Route 79)	General improvements
Lakeville	Malbone Street	General improvements
Freetown	Chace Road	Reconfigure or close driveway to the west
	Braley Road	General improvements
	East Chipaway Road	General improvements
New Bedford	Samuel Barnet Road	General improvements
	Pig Farm Road	General improvements
	Tarkiln Hill Road	Close Tarkiln Hill Road and reroute traffic through Stop & Shop driveway
		Signal pre-emption at King's Highway / Stop & Shop driveway
		Signal pre-emption at Tarkiln Hill Road / Church Street
		At-grade crossing pre-signals
	Nash Road	Signal pre-emption at Church Street / Nash Road
		At-grade crossing pre-signals
FALL RIVER SECONDARY		
Berkley	Mill Street	Close crossing
	Adams Lane	Close crossing
Freetown	Beachwood Road	Close crossing
	Richmond Road/Route 79 (North)	General Improvements
	Richmond Road/Route 79 (South)	Reconfigure driveway to the west
	Forge Road (North)	Close Forge Road
	Forge Road (South)	General improvements
	Elm Street	General improvements
	High Street	General improvements
	Copicut Road	General improvements
	Brightman Lumber	General improvements

The specific improvements within each municipality under the Stoughton Alternatives are described below. Except for the Longmeadow Rd. and Dean St. (Route 44) crossings in Taunton, these crossings are also part of the Whittenton Alternatives.

- **Canton**. Three at-grade crossings (Washington Street, Pine Street, and Will Drive) are located in Canton along the active commuter rail line. The construction of a second track along this section of the alignment and increased train activity would not result in substantial changes in traffic conditions or queue lengths at these crossings. As part of the proposed South Coast Rail project, traffic signal preemption is recommended at the intersection of Washington Street and Revere Street to address queuing that may extend over the tracks during the peak hours.

- **Stoughton**. Eight public at-grade crossings in Stoughton would be affected. Five of these at-grade crossings (Central Street, Simpson Street, School Street, Porter Street, and Wyman

Street) are active commuter rail at-grade crossings that would be modified to allow double-track operations. The addition of a second track and additional trains would result in negligible changes in traffic conditions or queue lengths at these crossings. A sixth crossing, at Brock Street, is considered active and has working signals but is rarely used today. For the purposes of this analysis, Brock Street is considered a reactivated crossing. A seventh crossing is proposed at Plain Street. An existing at-grade crossing at Morton Street would be closed and traffic would be rerouted to a proposed street that would run parallel to the proposed track and cross to the south underneath the track at a bridge.

- **Easton**. Eight currently inactive public at-grade crossings are located in Easton. All of the crossings in Easton would be reactivated as part of the South Coast Rail project. The Main Street crossing is currently grade separated and a new bridge that passes over the rail right-of-way will be constructed. A previous bridge at this location has been filled in; therefore, the new bridge would either be constructed on new abutments or the existing abutments that remain, and the embankment excavated to track grade below.

- **Raynham**. Six public at-grade crossings and one private crossing, all inactive, are located in Raynham. Five public at-grade crossings would be reactivated as part of the South Coast Rail project. The private crossing at the Race Track would also be reactivated as part of the South Coast Rail project. A sixth public at-grade crossing, across Broadway (Route 138), is projected to have relatively high traffic volumes and is recommended for at-grade separation to minimize traffic impacts along this section of Route 138.

- **Taunton.** Four public at-grade crossings are located in Taunton. Both the Ingell Street and Hart Street crossings are currently active crossings with freight train activity. These crossings would be upgraded to accommodate the proposed commuter rail trains. The at-grade crossing at Longmeadow Road would be reactivated as part of the South Coast Rail project. The Dean Street (Route 44) at-grade crossing is active with freight rail activity a few times a week. Similarly to Main Street, the Thrasher Street crossing is currently grade separated and a new bridge that passes over the rail right-of-way will be constructed. A previous bridge at this location has been filled in; therefore, the new bridge would either be constructed on new abutments or the existing abutments that remain, and the embankment excavated to track grade below.

- **Berkley.** Four existing public at-grade crossings and one private at-grade crossings are located in Berkley. Cotley Street, Padelford Street, Myricks Street (Route 79), and Mill Street currently carry active freight traffic. Mill Street is proposed to be closed. The three other crossings would be upgraded to accommodate the proposed commuter rail trains. Adams Lane, a private at-grade crossing, is also proposed to be closed

- **Lakeville.** One public at-grade crossing is located in Lakeville. The crossing at Malbone Street currently carries active freight traffic. This crossing would be upgraded to accommodate the proposed commuter rail trains.

- **Freetown.** Ten public at-grade crossings, two of which have a northern and southern section, and one private at-grade crossing in Freetown currently carry active freight traffic. The northern part of Forge Road would be closed and the remaining ten crossings would be

upgraded to accommodate the proposed commuter rail trains. Seven of these crossings are expected to cause minor delays and have little impact on the surrounding roadways.

- **New Bedford.** Three public at-grade crossings (Samuel Barnet Road, Tarkiln Hill Road, and Nash Road) and one private at-grade crossing (Pig Farm Road) currently carry active freight traffic and would be upgraded to accommodate the proposed commuter rail service.

- **Fall River.** There are no at-grade crossings in Fall River. All major street crossings within Fall River are grade-separated and all remaining private roadways crossings are expected to be closed.

Additional mitigation commitments specific to the Attleboro Secondary portion of the Whittenton Alternatives are summarized in Table 4.1-88. The Bay Street crossing is currently grade separated. The Bay Street Bridge has been filled in and would need to be reconstructed to provide adequate track clearance for the rail service. A new superstructure would be constructed on new abutments and the embankment fill excavated below to the proposed track grade.

Table 4.1-88 Attleboro Secondary Recommended Grade Crossing Mitigation Improvements (Whittenton Alternatives)

Town/City	Street	Recommended At-Grade Crossing Safety Improvements
Taunton	Tremont Street	Reconfigure driveway to the north
	Oak Street	Optimize existing pre-emption at Oak Street / Tremont Street
	Porter Street	Reconfigure driveway to the east
	Cohannet Street	Reconfigure or close driveways adjacent to the tracks
	Winthrop Street	Additional advance RR warning signs
	Somerset Avenue	Investigate installation of a traffic signal with pre-emption system at nearby intersection
	Weir Street	Close McSoley Street
		Close and reconstruct driveway to the west
		Close and reconstruct driveway to the east

MBTA Grade Crossing Safety Policies and Programs

MBTA Safety Department officials are regularly in the field inspecting stations, buses, subways, commuter rail and boats to ensure a safe environment. All stations and vehicles have direct communication lines to the MBTA's Operations Control Center and stations are being upgraded with modernized public address systems and closed-circuit television camera systems. MBTA personnel are trained in emergency response and their safety program (coordinated with local, state, federal law enforcement agencies, as well as the MBTA Police) includes a schedule of simulated emergency response exercises geared toward preparing MBTA personnel to be equipped with state-of-the-art emergency response techniques.

The MBTA Safety Department tracks all accidents and incidents throughout the MBTA system and is responsible for reporting all required safety and security data to the National Transit Database (NTD)17 and the Department of Public Utilities (DPU). The NTD is maintained by the Secretary of Transportation, per Title 49 U.S.C. 5335(a) SECTION 5335 National transit database. This data is used by the MBTA to measure safety on the MBTA and by the Federal Transit Administration (FTA) to track incident trends in the industry. The MBTA posts a monthly incident report on their public website. NTD reportable incidents are also posted on the NTD website at: http://www.ntdprogram.gov/ntdprogram/.

In order to minimize incidents within the system, the MBTA Safety Department has undertaken and/or maintains the following measures:

- Performs routine safety audits of all transit stations to note and correct safety hazards.
- Increased the number of track and platform audits.
- Performs audits of tunnel lighting.
- Established a zero tolerance policy pertaining to use of cell phones and all other electronic devices while operating an MBTA vehicle.
- Established the Safety and Operations Rules Compliance Program, which has performed over 2000 safety observations.

Commuter Rail Safety Education

Similar to the MBTA Greenbush Line project, the South Coast Rail project will require a comprehensive grade-crossing safety awareness program.

The MBTA will educate the public using the "Operation Lifesaver" program at least one year prior to the scheduled revenue operation date. "Operation Lifesaver" is a national non-profit organization whose program is available to any transit agency who is seeking to improve safety and education for communities that contain rail traffic. The program's railroad safety information and specially trained personnel can be used to train others to educate communities. The primary focus of the program is to communicate the importance of railroad public awareness, the potential hazards at highway/rail at-grade crossings, and the dangers of trespassing on railroad right-of-way.

During the design and early construction phases of the South Coast Rail project, the MBTA will:

- Train various groups and individuals, including students and community organizations, police officers, fire fighters, school officials, and agency staff.
- Conduct direct public contact through marketing, presentations, mass mailing, press releases, and conducting special safety fairs in every affected city and town.
- Training fire fighters and emergency response personnel in Emergency Evacuation Procedures.

[17] Title 49 U.S.C. 5335(a): SECTION 5335 National transit database. http://www.ntdprogram.gov/ntdprogram/ntd.htm.

4.1.5.2 Stations

New Bedford (Both Rail Alternatives)

The following intersection improvements are required to mitigate existing deficiencies at critical locations or adverse impacts caused by the alternatives. Table 4.1-89 presents a comparison of Build Alternatives without and with mitigation operations to illustrate the benefit of the proposed mitigation. The Mitigation associated with the Whale's Tooth and King's Highway stations are proposed as part of the Whittenton and Stoughton Alternatives.

Whale's Tooth Station Area Traffic Mitigation (Both Rail Alternatives)

Acushnet Avenue at Hillman Street—A pedestrian crosswalk is proposed at this location to accommodate the projected pedestrians. The crosswalk would be installed across the southern Acushnet Avenue approach to the intersection and provide a connection to the station from the residential area located to the west of Route 18.

Acushnet Avenue Sidewalk—Installation of a 6-foot wide sidewalk along the eastern side of Acushnet Avenue is proposed to complete the pedestrian connection from Hillman Street. The 300-foot long sidewalk would be between Hillman Street and the proposed station driveway.

Table 4.1-89 New Bedford Intersection Capacity Analysis –2030 Build with Mitigation Conditions vs. 2030 Build Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Build	Build with Mitigation			Build	Build with Mitigation		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Whale's Tooth Station								
Mill Street at Pleasant Street	F	0.76	47	D	E	0.93	64	E
Coggeshall Street at N. Front Street[4]	F	0.66	12	B	F	0.71	14	B
Coggeshall Street at Purchase Street[4]	F	0.53	13	B	F	0.62	14	B
King's Highway Station								
King's Highway at Route 140 NB Ramps	C	0.60	20	C	C	0.89	29	C
Church Street at Tarkiln Hill Road	C	0.74	24	C	D	0.79	29	C
King's Highway at Stop & Shop Driveway	A	0.52	9	A	B	0.82	29	C
King's Highway at King's Highway Station (Shaw's) Driveway	A	0.41	6	A	A	0.55	9	A
King's Highway at Mt. Pleasant Street	C	0.54	24	C	E	0.93	42	D

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 Unsignalized in the Build condition
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Mill Street at Pleasant Street and Kempton Street—Signal timing adjustments are proposed to accommodate project related pedestrians and traffic at this location. Signal timing changes would be made to provide a longer crossing interval for the exclusive pedestrian phase. The proposed mitigation at this location would improve operations to LOS D during the morning peak hour.

Coggeshall Street at North Front Street—This unsignalized intersection processes a high amount of traffic and operates at LOS F during the morning and evening peak hours with or without the project. To offset project related traffic at this intersection, a traffic signal would be installed. The proposed signal would be designed to operate with two phases, the first phase servicing Coggeshall Street and the second phase for North Front Street.

Pedestrian crossings would occur concurrently with these phases. With the proposed improvement, the intersection of Coggeshall Street at North Front Street would operate at LOS B during both the morning and evening peak hour.

As Coggeshall Street is under the jurisdiction of the City of New Bedford, any improvements to this intersection will require review and authorization by the City of New Bedford. Should these improvements be desired, MassDOT could contribute to the construction or implementation of these intersection improvements based on their fair share of the impacts to the intersection.

Coggeshall Street at Purchase Street—This unsignalized, all-way STOP controlled intersection processes a high amount of traffic and operates at LOS F during the evening peak hour with or without the project. To improve the identified safety issues at this location as well as offset project related traffic impacts, a traffic signal would be installed at this location. The proposed signal would be designed to operate with three phases, the first phase servicing Purchase Street and the second phase exclusively for pedestrian crossings and the third phase for Coggeshall Street. With the proposed improvement, the intersection of Coggeshall Street at Purchase Street would operate at LOS B during both the morning and evening peak hour.

As Coggeshall Street is under the jurisdiction of the City of New Bedford, MassDOT has coordinated the design of this intersection with the city as part of the *Freight Railroad Bridge Improvement Project, Rehabilitation of Bridges over Deane Street, Sawyer Street, and Coggeshall Street*. This bridge rehabilitation project, which is functionally independent of the South Coast Rail project, received $20 million in Transportation Infrastructure Generating Economic Recovery (TIGER) federal funding, part of which will help improve the signal at Deane Street at Purchase Street and install new signals at the intersections of Purchase Street at Sawyer Street and Purchase Street at Coggeshall Street.

King's Highway Station Traffic Mitigation (Both Rail Alternatives)

King's Highway Corridor—To accommodate project traffic, interconnection and coordination of the traffic signals along King's Highway is proposed. Signal controller upgrades, interconnection infrastructure (conduit/cable), signal timing and phasing improvements would be required at the following locations:

- Mount Pleasant Street at Jones Road/King's Highway
- King's Highway at Shaw's Driveway
- King's Highway at Route 140 Northbound Ramps

- King's Highway at Stop & Shop Driveway
- Tarkiln Hill Road at Church Street

Mount Pleasant Street at Jones Road/King's Highway—To improve traffic operations and pedestrian crossing times at this location, traffic signal phasing would be revised to provide a permissive eastbound/westbound phase. Traffic signal timings would be modified to support the new phasing. Signal timing and phasing changes will allow this intersection to return to acceptable traffic operations during the evening peak hour.

King's Highway at Shaw's Driveway—To facilitate pedestrian movements at this intersection a crosswalk would be provided across the Shaw's Driveway entrance. Concurrent pedestrian phasing would be provided to facilitate the pedestrian crossing. During the evening peak hour, traffic operations degrade from LOS A to LOS B in order to accommodate pedestrians. However, the intersection would still operate at an acceptable LOS during both peak hours.

King's Highway at Stop & Shop Driveway—Several changes are recommended for this location due to its proximity to the King's Highway grade crossing. The traffic signal would be modified to allow for traffic signal pre-emption when the train approaches the station. Should the vehicle queue along King's Highway extend over the railroad tracks, the signal would operate such that the queue would clear prior to the train's arrival. Pre-signals would be required at the grade crossing to support this movement and prevent additional traffic from driving over the railroad tracks.

The intersection of Tarkiln Hill Road and King's Highway would be closed for safety purposes due to its proximity to the grade crossing. As shown on Figure 4.1-70, traffic currently turning into or out of Tarkiln Hill Road at this location would be diverted to Stop & Shop and enter Tarkiln Hill Road at the back of the property. Approximately 24 parking spaces associated with the Stop & Shop Plaza and Wendy's Restaurant would be impacted by this diversion of Tarkiln Hill Road. To maintain the fastest possible emergency response times, mountable curbing would be used to close the exiting intersection. In the event of an emergency, this curbing could be driven over by emergency responders.

Tarkiln Hill Road at Church Street—A concurrent pedestrian crossing phase is proposed for the intersection of Tarkiln Hill Road at Church Street. Signal timing changes would be required to accommodate pedestrian movements, but LOS would not be affected during either peak hour.

Similar to King's Highway at Stop & Shop Driveway, the traffic signal would also be modified to allow for traffic signal pre-emption when the train approaches the station. Pre-signals at the grade crossing would support this movement and prevent additional traffic from driving over the railroad tracks.

Freetown Station Area Traffic Mitigation (Both Rail Alternatives)

The following three pedestrian-related improvements are suggested to improve connectivity between residential areas within walking distance to the proposed Freetown Station. Freetown Station is proposed as part of the Whittenton and Stoughton Alternatives.

South Main Street

To facilitate pedestrian travel from the north, construction of a 6-foot sidewalk is proposed on the east side of South Main Street from the existing sidewalk's terminus at Stop & Shop to the station driveway (approximately 1,600 feet).

South Main Street at Narrows Road

The existing crosswalk across South Main Street at Narrows Road is proposed to be restriped. As part of this improvement, ADA/AAB compliant wheelchair ramps would be constructed at this location.

South Main Street at Copicut Street

A pedestrian crosswalk is proposed at this location. The crosswalk would be installed across Copicut Street on the east leg of the intersection. Compliant ADA/AAB wheelchair ramps are also proposed.

Fall River Station Area Traffic Mitigation (Both Rail Alternatives)

The following three intersection improvements are suggested to mitigate existing deficiencies at critical locations or adverse impacts caused by the alternatives. Table 4.1-90 presents a comparison of Build to Build with mitigation operations to illustrate the benefit of the proposed changes. Both Fall River Stations are proposed as part of the Whittenton and Stoughton Alternatives.

Table 4.1-90 Fall River Intersection Capacity Analysis–2030 Build with Mitigation Conditions vs. Build Conditions (both alternatives)

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Build	Build with Mitigation			Build	Build with Mitigation		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Fall River Depot Station								
President Avenue at N. Davol Street	B	0.62	26	C	C	0.84	32	C
N. Main Street at President Avenue	D	0.81	24	C	D	0.88	35	D

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections

Fall River Depot Station Area Traffic Mitigation (Both Rail Alternatives)

North Main Street and President Avenue—Intersection geometry, signal timing and phasing improvements are proposed for this location to accommodate project related pedestrians and traffic and mitigate existing safety problems. Crash data indicate a high number of angle crashes occur at this intersection. Slight widening of the North Main Street approaches is proposed to provide exclusive left-turn lanes and through-right-turn lanes. In addition, signal phasing would be revised to provide protected/permissive left-turn phasing for the westbound approach. Signal timing changes would be made to accommodate the proposed phasing change and provide a longer interval for the exclusive pedestrian phase. The proposed mitigation at this location would improve the morning peak hour from LOS D to LOS C. The evening peak hour would remain at LOS D.

President Avenue at North Davol Street—Pedestrian crossing times would increase to accommodate project related pedestrians at this location, which would cause an adverse impact to overall vehicular traffic operations (i.e. increased delay) under every alternative during at least one peak hour. However, the intersection is projected to operate at acceptable levels of service with these pedestrian timing improvements.

Battleship Cove Station Area Traffic Mitigation (all alternatives)

Broadway at Central Street—No changes are proposed to traffic operations at this location. Existing crosswalks across Broadway and Central Street (under the viaduct) would be restriped to facilitate the pedestrian pathway between the neighborhood and the proposed Battleship Cove Station. As part of this measure, existing wheelchair ramps would be evaluated to determine whether they comply with the current standards as prescribed by the Americans with Disabilities Act (ADA) and the Architectural Access Board (AAB). Non-compliant wheelchair ramps would be redesigned based on the prevailing ADA/AAB guidance in affect at that time.

Taunton Station Area Traffic Mitigation

The following intersection improvements are required to mitigate existing deficiencies at critical locations or adverse impacts caused by the alternatives. Table 4.1-91 presents a comparison of Build to Build with mitigation operations to illustrate the benefit of the proposed changes. The Taunton Depot station is proposed as part of the Whittenton and Stoughton Alternatives.

Table 4.1-91 Taunton Depot Intersection Capacity Analysis–2030 Build with Mitigations Conditions vs. 2030 Build Conditions

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Build	Build with Mitigation			Build	Build with Mitigation		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Taunton Depot Station (all alternatives)								
Route 140 at Hart Street	E	>1.00	66	E	F	>1.00	73	E

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Taunton Depot Station Area Traffic Mitigation (Both Rail Alternatives)

Route 140 at Hart Street (Both Rail Alternatives)—The signal timing at the Route 140 and Hart Street intersection would be adjusted to reduce delays on the Hart Street approaches. This results in an improvement during the evening peak hour from LOS F to LOS E.

Sidewalk Improvements (Both Rail Alternatives)

To facilitate pedestrian travel from Route 140 to the station, construction of a 6-foot wide sidewalk is proposed on the north side of the Target Plaza parking lot from the terminus of Taunton Depot Drive's sidewalk to the station.

Dana Street Station Area Traffic Mitigation (Whittenton Alternatives)

Mitigation previously proposed in the DEIS/DEIR at the intersection of Route 140/Tremont Street at Oak Street was developed to support optimizing the grade crossing pre-emption timing at the Oak Street grade crossing. Although project impacts would be lower with the station on Dana Street, the mitigation measures are still being proposed to compliment adjacent grade-crossing improvements. Based on the projected traffic volumes, the Washington Street southbound approach would be reconfigured to provide an exclusive right-turn lane and a combined left turn/through lane. Traffic signal phasing would be revised to provide an overlap southbound right-turn phase during the Tremont Street eastbound phase. A longer crossing interval for the exclusive pedestrian phase would also be provided.

Due to the relocation of the station to Dana Street, additional mitigation measures are required. The existing crosswalks at the intersection of Route 140/Tremont Street and Granite Street should be restriped. Specialty (high visibility) materials should be considered for the crosswalk as it would provide a gateway to the station would likely get substantially more use than it does today. It does not appear that the proposed Dana Street Station would generate enough traffic such that a traffic signal would be warranted at the station driveway or at the intersection of Route 140/Tremont Street at Granite Street.

The Dana Street Station is proposed in a more residential area of Taunton than the previously proposed station. Traffic volumes along Danforth Street, Dana Street, Granite Street, Columbia Avenue, Hodges Avenue, and Morton Street would need to be monitored for cut-through traffic and speeds in order to alleviate the new flow in a residential area. Traffic calming mitigation plans may be needed to address these issues if and when the station opens to vehicular traffic.

Previously proposed traffic signal timing changes at the intersection of Washington Street and Court Street and a proposed traffic signal installation at the intersection of Washington Street at Frederick Martin Parkway are no longer being considered as part of the South Coast Rail project as they are no longer needed due to the lower numbers of, and a shift in, ridership.

Taunton Station Area Traffic Mitigation (Stoughton Alternative)

All mitigation measures related to Taunton Station that were proposed in the DEIS/DEIR are still recommended. Minor additional signal timing changes are needed at the intersection of Route 44 and Longmeadow Road. In addition to what was recommended in the DEIS/DEIR, based on new ridership estimates, mitigation measures at the intersection of Arlington Street and School Street were considered. Based on peak hour volume data, the intersection does not meet the peak hour traffic signal warrant. Consideration should be given to conversion of this two-way stop controlled intersection to an all-way stop controlled intersection to improve operations and safety.

Table 4.1-92 Signalized Intersection Traffic Operations–Build vs. Build with Mitigation

	2035 Weekday Morning Peak Hour				2035 Weekday Evening Peak Hour			
	Build	Build with Mitigation			Build	Build with Mitigation		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
Broadway St at Washington St	D	0.70	28	C	E	0.90	51	D
Route 44 at Longmeadow Road	F	>1.00	74	E	F	>1.00	>80	F
Route 44 at Arlington Street	F	0.89	35	C	E	0.90	32	C

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Broadway at Washington Street (Stoughton Alternative)—The signal timing at the Broadway and Washington Street intersection would be adjusted to reduce delays on the Washington Street approaches during the evening peak hour. This timing adjustment results in an improvement during the evening peak hour from LOS F to LOS E.

Dean Street at Longmeadow Road (Stoughton Alternative)—Based on the projected traffic volumes, the Longmeadow Road southbound approach would be reconfigured to provide two general purpose lanes. Traffic signal timings would be modified to support revised signal timings and provide a longer crossing interval for the exclusive pedestrian phase. The increased pedestrian crossing times would cause an adverse impact to overall vehicular traffic operations (i.e. delay) during both peak hours. There is no opportunity at this location to increase capacity by adding lanes or changing lane allocation. However, once the project is in service, traffic and pedestrian signal timings would be further adjusted to balance the needs of pedestrians and motorists.

Dean Street at Prospect Street (Stoughton Alternative)—Proposed improvements at this intersection involve construction of ADA/AAB-compliant pedestrian ramps, new crosswalk and pavement markings across Dean Street. A passively-activated flashing pedestrian crossing sign would be installed at the Dean Street crosswalk. This sign, activated when a pedestrian entered a detection zone at the pedestrian ramps of the crossing, would highlight the location as an active pedestrian crossing to approaching motorists.

Dean Street at Arlington Street (Stoughton Alternative)—Improvements at this intersection would involve widening of the Arlington Street southbound approach to provide exclusive turning lanes and reconstruction of the existing traffic signal system in order to coordinate with the proposed gate and railroad signal improvements at the adjacent grade crossing. Signal timing and phasing changes will allow this intersection to remain at acceptable traffic operations during both peak hours.

As Dean Street (Route 44) is under the jurisdiction of the Massachusetts Department of Transportation Highway Division (MassDOT Highway Division) and the City of Taunton, MassDOT would coordinate construction and implementation of these intersection improvements with MassDOT Highway Division and the city at the appropriate time.

Stoughton Station Area Traffic Mitigation (Stoughton and Whittenton Alternatives)

Brock Street at Washington Street

A traffic signal would be warranted at the intersection of Brock Street at Washington Street under the Build Condition, and is recommended since the intersection would serve the primary station entrance. A capacity analysis for the signalized intersection was performed and the results were compared to the Build Condition (as an unsignalized intersection). The morning and evening peak hour under the signalized and unsignalized conditions are shown in Table 4.1-93. Signalizing the intersection upon relocation of the station would improve vehicle operations and mobility through the intersection.

Table 4.1-93 Brock Street/Kinsley Street at Washington Street–Build Condition

		Morning Peak Hour				Evening Peak Hour			
Condition	**Movement**	**Dem[1]**	**v/c[2]**	**Del[3]**	**LOS[4]**	**Dem**	**v/c**	**Del**	**LOS**
Unsignalized	EB LT-TH-RT	285	>1.20	>120	F	295	>1.20	>120	F
	WB LT-TH-RT	100	>1.20	>120	F	115	>1.20	>120	F
	NB LT-TH-RT	440	0.17	5	A	490	0.13	4	A
	SB LT-TH-RT	355	0.0	1	A	810	0.01	1	A
Signalized	**Approach**	**Dem**	**v/c**	**Del**	**LOS**	**Dem**	**v/c**	**Del**	**LOS**
	EB	285	0.66	21	C	295	0.65	27	C
	WB	100	0.22	13	B	115	0.29	19	B
	NB	440	0.76	17	B	490	0.60	11	B
	SB	355	0.42	9	A	810	0.87	19	B
	Overall	-	0.72	16	B	-	0.80	18	B

Source: Synchro 7 (Build 773, Rev 8) software
Note: Shaded cells denote LOS E/F conditions.
1 demand in vehicles per hour
2 volume-to-capacity ratio, values over 1.0 indicate demand in excess of capacity.
3 average delay in seconds per vehicle
4 level of service for critical movement
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound; LT = left-turn; TH = through; RT = right-turn

Under traffic signal control, the calculated 95th percentile queue along Brock Street is 119 feet during the morning peak hour and 166 feet during the evening peak hour. This does not include additional queuing due to the active grade crossing. The available queue storage between the intersection of Brock Street at Washington Street and the tracks is approximately 130 feet. As traffic signal design progresses, queue detection and separate traffic signal heads at the grade crossing should be incorporated.

Wyman Street at Summer Street/Morton Street

The intersection of Summer Street/Wyman Street/Morton Street has atypical geometry and only the Summer Street approach is currently under traffic control. The intersection also includes two driveways that serve existing MBTA parking lots. Relocating Stoughton Station provides an opportunity to reconstruct this intersection. The following mitigation measures are recommended:

- Eliminate the Morton Square MBTA driveway and parking area;
- Close the Trackside Plaza South driveway; and
- Realign Morton Street and install a stop sign.

Two measures to mitigate impacts at the Brock St. grade crossing are recommended:

- The proposed traffic signal design plans should consider the effects of incorporating gate operations and restricting movements from Washington Street to Brock Street while the crossing gates are down. This would require changes in geometry along Washington Street to provide a separate northbound left-turn lane and southbound right-turn lane. The existing shoulders on Washington Street may be sufficiently wide to make these changes without the need for land acquisition.

- The traffic signal design plans should modify the existing driveways immediately east of the crossing to discourage motorists from using the parking lot as a way to avoid the traffic signal.

Easton Station Area Traffic Mitigation (Stoughton and Whittenton Alternatives)

Preliminary mitigation measures have been developed for locations that are projected to accommodate a substantial amount of project-related traffic and operate at or over capacity. The proposed mitigation for the Easton stations include signalization of the Union Street and Elm Street intersections with Route 138, pedestrian-related improvements in Easton Village area, and signal timing adjustments at the intersections of Route 138 and Roche Brothers Drive and Route 138 and Belmont Street. Table 4.1-94 presents a comparison of Build to Build with mitigation operations to illustrate the benefit of the proposed changes. Both Easton Stations are proposed as part of the Whittenton and Stoughton Alternatives.

Easton Village Traffic Mitigation (Stoughton and Whittenton Alternatives)

Due to the historic nature of the Easton Village area, specifically the Rockery monument, structural improvements to provide additional capacity are infeasible. Pedestrian level improvements are proposed for the area near this village-style station.

Main Street at Center Street and Lincoln Street (Stoughton and Whittenton Alternatives)—Proposed improvements at this intersection involve construction of ADA/AAB-compliant pedestrian ramps, new crosswalk and pavement markings. A passively-activated flashing pedestrian crossing sign would be installed at the Main Street crosswalk. This sign, activated when a pedestrian entered a detection zone at the pedestrian ramps of the crossing, would highlight the location as an active pedestrian crossing to approaching motorists.

Table 4.1-94 Easton Intersection Capacity Analysis–2030 Build with Mitigation Conditions vs. 2030 Build Conditions (Stoughton and Whittenton Alternatives)

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Build	Build with Mitigation			Build	Build with Mitigation		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C	Delay	LOS
North Easton Station								
Route 138 at Roche Bros. Way	D	0.98	39	D	C	0.69	21	C
Route 138 at Main Street	F	1.00	39	D	E	>1.00	43	D
Route 138 at Elm Street[4]	F	0.84	27	C	F	0.84	36	D
Route 138 at Union Street[4]	F	0.70	10	A	F	1.00	46	D
Easton Village Station								
Route 138 at Belmont Street (Rt. 123)	E	0.87	53	D	F	0.93	58	E

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 Unsignalized in the Build condition
L = Left-turn; T = Through; R = Right-turn; All = All movements
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Lincoln Street at Barrows Street (Stoughton and Whittenton Alternatives)—New crosswalk and stop line pavement markings would be installed at the Lincoln Street and Barrows Street intersection to improve visibility and safety. Wheelchair ramps would be assessed for ADA/AAB compliance and reconstructed if necessary.

Route 138 at Belmont Street (Route 123) (Stoughton and Whittenton Alternatives)—Measures have been proposed to mitigate traffic impacts associated with the full build-out of Queset Commons, a proposed mixed-use development in Easton Village. These measures include the reconfiguration of the site's driveway approach to an exclusive left turn lane with a combined through-right turn lane to allow overlapping left-turn phasing with the Belmont Street approach. It is recommended that this lane and phasing adjustment not be installed and that the approach remain in the initial mitigation configuration of a left turn-through lane and an exclusive right-turn lane with split phasing. With that configuration, the intersection is projected to operate at LOS E or better during both peak periods.

North Easton Station Area Traffic Mitigation (Stoughton and Whittenton Alternatives)

Route 138 at Roche Brothers Driveway (Stoughton and Whittenton Alternatives)—Minor traffic signal timing adjustments are proposed for this location. These adjustments are recommended to increase the crossing time for pedestrians crossing Route 138 and to facilitate exiting station traffic during the evening peak period. While these improvements are recommended for mobility reasons, they are not required to mitigate adverse project impacts. Levels of service during the morning and evening peak hours remain unchanged and at acceptable levels.

Route 138 at Union Street (Stoughton and Whittenton Alternatives)—This unsignalized intersection processes a high amount of traffic and operates at LOS F during the morning and evening peak hour with or without the project. To offset project related traffic at this intersection, a traffic signal would be installed at this location. The proposed signal would be designed to operate with three phases; the first phase serving as a lead phase for Route 138 southbound and the second phase for both northbound and

southbound Route 138. The third phase processes Union Street traffic. The new intersection would include concurrent pedestrian phases, wheelchair ramps and crosswalks. Pedestrian crossings would occur concurrently with these second and third phases. With the proposed improvement, the intersection of Route 138 and Union Street would operate at LOS A and LOS D during the morning and evening peak hour, respectively.

Signalization may be warranted at this intersection. Should these improvements be desired, MassDOT could contribute to the construction/implementation of these intersection improvements based on their fair share of the impacts to the intersection.

Route 138 at Elm Street (Stoughton and Whittenton Alternatives)—This unsignalized intersection processes a high amount of traffic and operates at LOS F during both the morning and evening peak hours with or without the proposed project. To offset project related traffic impacts at this intersection, a traffic signal would be installed. The proposed signal would be designed to operate with three phases; the first phase serving Route 138 northbound and southbound, the second phase serving Elm Street eastbound and the final phase serving Elm Street westbound. The new traffic signal would include concurrent pedestrian phases, wheelchair ramps and crosswalks. With the proposed improvement the intersection of Route 138 and Elm Street would operate at LOS C and LOS D during the morning and evening peak hour, respectively.

Signalization may be warranted at this intersection. Should these improvements be desired, MassDOT could contribute to the construction/implementation of these intersection improvements based on their fair share of the impacts to the intersection.

Route 138 at Main Street (Stoughton and Whittenton Alternatives)—This signalized intersection processes a high amount of traffic and would operate at LOS E during the morning peak hour and LOS F during evening peak hour without the project in place. With the proposed project, the intersection operates at LOS F during both peak hours. Traffic signal timing and phasing adjustments would be completed at this location to offset impacts from the proposed project. Specifically, a Main Street eastbound overlap right-turn phase would be added to the northbound/southbound Route 138 left-turn lead phase. The Main Street left-turn lead phase would be eliminated. Signal timing adjustments would be made to support the proposed changes. These proposed changes would allow the intersection of Route 138 at Main Street to operate at an acceptable LOS D during both the morning and evening peak hours.

Raynham Station Area Traffic Mitigation (Stoughton and Whittenton Alternatives)

The proposed mitigation for the Raynham Park Station includes signalization of the Raynham Park driveway, which would also be used as the station driveway, and signal timing adjustments at the intersection of Route 138 and Elm Street. Table 4.1-95 presents a comparison of Build to Build with mitigation operations to illustrate the benefit of the proposed changes. Raynham Park Station is proposed as part of the Whittenton and Stoughton Alternatives.

Table 4.1-95 Raynham Intersection Capacity Analysis–2030 Build with Mitigation vs. 2030 Build Conditions (Stoughton and Whittenton Alternatives)

	Weekday Morning Peak Hour				Weekday Evening Peak Hour			
	Build	Build with Mitigation			Build	Build with Mitigation		
Signalized Intersections	LOS[1]	V/C[2]	Delay[3]	LOS	LOS	V/C[2]	Delay[3]	LOS
Raynham Park Station								
Route 138 at Elm Street	B	0.79	21	C	B	0.83	22	C
Route 138 at Raynham Park Station Driveway[4]	F	0.56	12	B	F	0.63	14	B

Source: Synchro 7.0 Software; Build 763
1 level of service
2 volume-to-capacity ratio
3 average control delay for all vehicles, rounded to the nearest whole second, for signalized intersections
4 Unsignalized in the Build condition
L = Left-turn; T = Through; R = Right-turn
NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound

Route 138 at Raynham Park Station (Stoughton and Whittenton Alternatives)

As part of the Raynham Park driveway signalization, the Robinson Street intersection on Route 138 would be shifted slightly north to align with the Raynham Park driveway, creating a four-way intersection. Route 138 would be widened at the intersection to accommodate an exclusive left-turn lane and two through lanes on the northbound approach and two general purpose lanes on the southbound approach. The new intersection would include pedestrian phases, wheelchair ramps and crosswalks. As shown in Table 4.1-95, the four-way signalized intersection would operate at LOE B in the morning and evening peak hours. These represent improved operations over the projected LOS F under Build conditions without mitigation.

As Route 138 is under the jurisdiction of MassDOT Highway Division, MassDOT would coordinate construction/implementation of these intersection improvements with MassDOT Highway Division at the appropriate time.

Route 138 at Elm Street (Stoughton and Whittenton Alternatives)

The signal timing at the Route 138 and Elm Street intersection would be adjusted to reduce delays on the Elm Street approaches and to provide adequate time for pedestrian crossings. The result is that all approaches would operate at acceptable levels of service but overall intersection operations would decline slightly from LOS B to LOS C.

4.1.6 Summary

The traffic analysis evaluated the traffic impacts of each of the commuter rail stations proposed as part of the Build Alternatives. Additionally, regional highway operations were evaluated to determine projected benefits of the regional transit enhancement associated with each of the alternatives. Traffic conditions in the vicinity of each station and along the regional highway network were analyzed for existing conditions and future 2030 conditions with and without the project. Mitigation would be implemented for roadways and intersections that would be most impacted by traffic associated with commuter rail stations associated with rail alternatives. In cases where Build Alternatives-related traffic would result in a degradation of operating conditions when compared to the No-Build Alternative,

mitigation measures were evaluated and would be implemented to address these impacts. Table 4.1-96 presents the recommended traffic mitigation for the project summarized by alternatives and stations.

Table 4.1-96 Recommended Traffic Mitigation Summary

Station	Intersection/Roadway	Mitigation
Stoughton and Whittenton Alternatives		
Fall River Depot Station	North Main Street at President Avenue	Widen North Main Street to provide an exclusive northbound and southbound left-turn lane Modify traffic signal phasing to provide a westbound lead phase and exclusive pedestrian phase
	President Avenue at N. Davol Street	Pedestrian timing improvements
Battleship Cove Station	Broadway at Central Street	Crosswalk and pedestrian ramp improvements
	Broadway at Anawan Street	Crosswalk and pedestrian ramp improvements
Freetown Station	South Main Street	Construction of approx. 1,600 feet of sidewalk along the eastern side of South Main Street
	South Main Street at Narrows Road	Crosswalk and pedestrian ramp improvements
	South Main Street at Copicut Street	Crosswalk and pedestrian ramp improvements
Whale’s Tooth Station	Acushnet Avenue at Hillman Street	Crosswalk and pedestrian ramp improvements
	Acushnet Avenue	Construction of approx. 300 feet of sidewalk along eastern side of Acushnet Avenue
	Mill Street at Pleasant Street and Kempton Street	Revised signal timing, including longer pedestrian timings
	Coggeshall Street at North Front Street	Install traffic signal
	Coggeshall Street at Purchase Street	Install traffic signal
King’s Highway Station	King’s Highway	Install signal interconnect infrastructure between Mount Pleasant Street and Church Street
	Mount Pleasant Street at Jones Road/King’s Highway	Revised signal phasing and timings
	King’s Highway at Shaw’s Drive	Signal equipment, phasing and timing improvements to provide concurrent pedestrian crossing
	King’s Highway at Stop & Shop Drive	Grade crossing signal pre-emption Reconfigure Stop & Shop Drive to accommodate diverted Tarkiln Hill Road traffic
King’s Highway Station	Tarkiln Hill Road at Church Street	Grade crossing signal pre-emption Revised signal timing , including longer pedestrian timings

Station	Intersection/Roadway	Mitigation
Taunton Depot Station	Route 140 at Hart Street	Revised signal timing
	Taunton Depot Drive	Construction of sidewalk along the northern side of the Target Plaza parking lot to station area
Whittenton Alternative		
Dana Street Station	Tremont Street at Granite Street	Restripe existing crosswalks using high visibility materials
	Washington Street at Tremont Street	Review existing grade crossing pre-emption timing Restripe Washington Street for an exclusive right-turn and combined left/thru lanes Revised signal timing , including longer pedestrian timings
	General	Prepare traffic calming mitigation plan.
Stoughton Alternative		
Taunton Station	Broadway and Washington Street	Revised signal timing
	Dean Street at Longmeadow Street	Restripe Longmeadow Street to provide two southbound lanes Revised signal timing, including longer pedestrian timings
	Dean Street at Prospect Street	Install pavement marking and signage improvements
	Dean Street at Arlington Street	Reconstruct traffic signal system based on new adjacent grade crossing equipment Widen Arlington Street to provide two southbound lanes
	Arlington Street at School Street	Convert to all-way stop
Stoughton and Whittenton Alternatives		
Raynham Park Station	Route 138 at Elm St.	Revised signal timing, including longer pedestrian timings
	Route 138 at Dog Track/Station Driveway	Re-align Robinson Street to create 4-way intersection Widening of Route 138 to provide two lanes northbound and southbound Install traffic signal
Easton Village Station	Route 138 at Belmont Street	Revised signal phasing and timings
	Main Street at Center Street/Lincoln Street	Install pavement marking and signage improvements
	Lincoln Street at Barrows Street	Install pavement marking and signage improvements
North Easton Station	Route 138 at Roche Bros. Way	Revised signal timings
	Route 138 at Main St.	Revised signal timing, including longer pedestrian timings
	Route 138 at Elm St.	Widening of Route 138 to provide two lanes northbound and southbound

Station	Intersection/Roadway	Mitigation
		Install traffic signal
	Route 138 at Union St.	Widening of Route 138 to provide two lanes northbound and southbound
		Install traffic signal
Stoughton Station	Brock Street at Washington Street	Install traffic signal
	Wyman Street at Summer Street/Morton Street	Reconstruct intersection (eliminating driveways, realign Morton St. and install stop sign).

The impact analysis examined the traffic and safety impacts associated with the public grade crossings that would be in service along each of the Build Alternatives, with each crossing's recommended treatment (grade separation, closure, or at-grade crossing). Traffic conditions at existing grade crossings were evaluated, as increased train frequency at these grade crossings could affect traffic flows and roadway capacity on either side of each grade crossing. The grade crossing incident analysis summarized the probability of an incident occurring over the span of a year at each of the proposed at-grade crossings along each of the Build Alternatives as well as the probability of an incident occurring at each of the intersections that currently contain rail operations.

Based on the traffic and safety analysis conducted, general recommendations for traffic and safety improvements were made for all Build Alternatives. These general improvements include measures to optimize safety at the proposed at-grade crossings, including design features, signage, site conditions, signals and operations, vital logic and automatic highway crossing warning systems. Additionally, site-specific mitigation measures that could be undertaken by MassDOT to offset these impacts were presented by municipality and street. These specific improvements range from minor to major construction. Where structural changes to the roadway and traffic control devices are proposed, mitigation measures aim to improve traffic flow with minimal impacts to adjacent land uses and at reasonable cost. Table 4.1-97 presents the recommended at-grade crossing safety improvements for the Stoughton and Whittenton Alternatives, respectively, summarized by municipality and street.

Table 4.1-97 Recommended Grade Crossings Mitigation Summary

Town/City	Street	Recommended At-Grade Crossing Safety Improvements
STOUGHTON LINE		
Canton	Washington Street	Install a traffic signal pre-emption system at two intersections in proximity of the crossing
	Pine Street	Relocate existing driveway to the north
	Will Drive	General improvements
Stoughton	Central Street	Relocate existing driveway to the west
		Coordinate crossing operation with fire station located 400 feet west
		Extend sidewalk through the crossing
		Install crosswalk across the Central Street eastbound approach to the crossing
	Simpson Street	General improvements
	School Street	Modify alignment at Cushing Street
	Porter Street (Route 27)	General improvements
	Wyman Street	Reconfigure parking lot and driveway

Town/City	Street	Recommended At-Grade Crossing Safety Improvements
	Brock Street	Investigate installation of a traffic signal with pre-emption system at nearby intersection Reconfigure driveway to the east and relocate driveway to the west
	Plain Street	Investigate installation of a traffic signal with pre-emption system at nearby intersection Relocate driveways to the east
	Morton Street	Close Morton Street Construct frontage road to Totham Farm Road
Easton	Elm Street	Relocate driveway to the east
	Oliver Street	Relocate driveways to the northwest Relocate children's play area Extend sidewalk through crossing
	Gary Lane	Install gates and locks
	Short Street	General improvements
	Depot Street (Route 123)	Reconfigure driveway to the west
	Purchase Street	General improvements
	Prospect Street	General improvements
	Foundry Street (Route 106)	General improvements
Raynham	Race Track Crossing	General improvements
	Elm Street	General improvements
	Carver Street	Reconstruct culvert
	Broadway (Route 138)	At-grade separation
	Britton Street	General improvements
	King Philip Street	Relocate driveways
	East Britannia Street	General improvements
Taunton	Longmeadow Road	Reconfigure or close driveways
	Dean Street (Route 44)	Reconstruct Dean Street/Arlington Street traffic signal system Install traffic pre-emption phasing at Dean Street/Arlington Street
NEW BEDFORD MAIN LINE		
	Ingell Street	Close driveway to the west
	Hart Street	General improvements
Berkley	Cotley Street	General improvements
	Padelford Street	General improvements
	Myricks Street (Route 79)	General improvements
Lakeville	Malbone Street	General improvements
Freetown	Chace Road	Reconfigure or close driveway to the west
	Braley Road	General improvements
	East Chipaway Road	General improvements
New Bedford	Samuel Barnet Road	General improvements
	Pig Farm Road	General improvements

Town/City	Street	Recommended At-Grade Crossing Safety Improvements
	Tarkiln Hill Road	Close Tarkiln Hill Road and reroute traffic through Stop & Shop driveway Signal pre-emption at King's Highway / Stop & Shop driveway Signal pre-emption at Tarkiln Hill Road / Church Street At-grade crossing pre-signals
	Nash Road	Signal pre-emption at Church Street / Nash Road At-grade crossing pre-signals
FALL RIVER SECONDARY		
Berkley	Mill Street	Close crossing
	Adams Lane	Close crossing
Freetown	Beachwood Road	Close crossing
	Richmond Road/Route 79 (North)	General Improvements
	Richmond Road/Route 79 (South)	Reconfigure driveway to the west
	Forge Road (North)	Close Forge Road
	Forge Road (South)	General improvements
	Elm Street	General improvements
	High Street	General improvements
	Copicut Road	General improvements
	Brightman Lumber	General improvements
ATTLEBORO SECONDARY (Whittenton Alternatives Only)		
Taunton	Tremont Street	Reconfigure driveway to the north
	Oak Street	Optimize existing pre-emption at Oak Street / Tremont Street
	Porter Street	Reconfigure driveway to the east
	Cohannet Street	Reconfigure or close driveways adjacent to the tracks
	Winthrop Street	Additional advance RR warning signs
	Somerset Avenue	Investigate installation of a traffic signal with pre-emption system at nearby intersection
	Weir Street	Close McSoley Street Close and reconstruct driveway to the west Close and reconstruct driveway to the east

The MBTA Safety Department also seeks to minimize incidents within the system through grade crossing safety policies and programs, such as routine safety audits and the Safety and Operations Rules and Compliance Program.

4.2 LAND USE AND ZONING

4.2.1 Introduction

This chapter characterizes land uses and zoning in the study area and assesses the impacts of the alternatives on land use. Section 4.2.1 defines land use and zoning, and provides the regulatory context for studying this resource. Section 4.2.2 identifies the South Coast Rail project study area, summarizes regional land use conditions, and describes existing conditions (relative to land use and zoning) within the study area. Section 4.2.3 discusses the effects to land use that may result from implementing each of the proposed South Coast Rail project alternatives (including railroad alignments, stations and layover facilities). Any parcels that would be acquired for construction or reconstruction for any component of each of the alternatives are also identified in Section 4.2.3. The parcels, or portions of parcels, would be acquired by the state and by definition become publicly owned. Existing land uses would be converted to transportation/utilities uses.

The Secretary of the Executive Office of Energy and Environmental Affairs (EEA)[1] issued a Certificate on the ENF on April 3, 2009. The certificate includes a number of requirements defining the scope of the Environmental Impact Report (EIR). However, no specific requirements for evaluation of impacts to land uses or to the social and economic environment are included in the Certificate.[2]

4.2.1.1 Resource Definition

Land use refers to the types of activities occurring on a parcel, as determined by aerial photograph interpretation, local zoning designation, and field observation. Common land uses in the South Coast region include residential, commercial, recreational, and undeveloped land. Zoning is a system of land-use regulation that prescribes the use to which land may be put, based upon local (municipal) jurisdiction. Zoning is defined by the Commonwealth of Massachusetts as "ordinances and by-laws, adopted by cities and towns to regulate the use of land, buildings and structures to the full extent of the independent constitutional powers of cities and towns to protect the health, safety and general welfare of their present and future inhabitants."[3]

4.2.1.2 Regulatory Context

There are no state or federal regulations applicable to the evaluation of land use. The CEQ NEPA regulations do require that an Environmental Impact Statement evaluate a proposed action's impact on "urban quality, historic and cultural resources, and the design of the built environment," including the reuse and conservation potential of various alternatives and mitigation measures.[4] The Corps' public interest review includes land use as a public interest factor (33 C.F.R. § 320.4(a)).

4.2.1.3 Methodology

The following describe how potential direct effects of the South Coast Rail project to land use were evaluated. Potential indirect land use changes (such as changes in growth patterns) associated with the alternatives are addressed separately in Chapter 5, *Indirect and Cumulative Impacts*.

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[1] Formerly, the Executive Office of Environmental Affairs.

[2] Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. South Coast Rail Project. April 3, 2009.

[3] Commonwealth of Massachusetts. *MGL c. 40A Zoning, s. 1A Definitions, "Zoning."*

[4] Council on Environmental Quality. 2009. *Code of Federal Regulations (CFR), Title 40: Protection of the Environment, Part 1502-Environmental Impact Statement, Section 16(g) Environmental Consequences (40 CFR 1502.16(g)).*

Potential direct effects to land use were evaluated by first reviewing areas where construction would be required for each of the alternative alignments outside of the existing rights-of-way. For the purposes of this evaluation, “construction” is defined as upgrading existing rail lines, reconstructing rail lines along out-of-service railroad alignments, constructing entirely new railroads, replacing existing railroad bridges and culverts, constructing new permanent or temporary railroad bridges, reconfiguring at-grade road/railroad crossings, constructing new grade-separated road/railroad crossings, constructing or reconstructing train or bus stations, and constructing layover facilities.

The analysis was conducted to determine if land acquisition would be required to accommodate construction, and identify the ownership and use of parcels designated for acquisition. “Land acquisition” is defined as taking a greater than 500-square-foot portion, or a sliver greater than 10 feet wide, of any parcel outside of the existing rights-of-way to accommodate permanent construction impacts, and is based on preliminary engineering plans. Final engineering plans may show an increase or decrease of the actual area of acquisition required, land use would be unlikely to change as a result of parcel acquisition below these thresholds, and social and economic effects would be negligible. Temporary construction impacts outside of the existing rights-of-way would not require land acquisition and are therefore not considered in this evaluation. Narrow slivers of parcels or temporary construction easements were not considered in the evaluation of land acquisition, given the scale and accuracy of the preliminary engineering plans. Aerial photographs and land use maps were examined in reference to preliminary engineering plans to identify encroachments onto adjacent parcels.

The parcel ownership and land usage were identified using multiple sources, including aerial photography, field visits, MassGIS (2005 data) and municipal mapping (obtained in 2008), information provided by Southeastern Regional Planning and Economic Development District (SRPEDD), and the *South Coast Rail Economic Development and Land Use Corridor Plan* (the Corridor Plan).[5] The general land use categories depicted on the maps reflect land use designations identified by the specific source(s) used or were aggregated for map legibility purposes. For example, the generalized land use category “open water” was based on the 2005 Land Use layer provided by MassGIS, and is also included in the DEP wetlands layer. Zoning designations were obtained from the respective communities within the study area. Because the data used for this analysis were derived from several sources with differing definitions of land use and zoning designations, these categories have been generalized in this evaluation for a suitable comparison. Four general categories of privately owned parcel land uses and zoning designations were established: residential, commercial, industrial, and undeveloped. The “industrial” category encompasses industrial businesses as well as transportation corridors and sites such as sand and gravel mining operations, the “undeveloped” category encompasses natural open space, parks and recreation sites, and agricultural lands and the “commercial” category includes institutional uses such as schools and places of worship. Where appropriate for the purposes of this evaluation, land use or zoning identified as transportation/utilities by one or more of the above sources is specifically noted as such rather than generalized as industrial.

MassGIS data supplemented by municipal data and field visits were used to characterize and map land uses and zoning at each proposed station site, within 0.5 mile radius of each proposed station site, and within 0.5 mile of each section of the alternative corridors that is not currently in transportation use.[6] These distances were selected as the maximum extent of resource areas that could potentially be affected by the proposed project.

[5] EOT. 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston.

[6] Zoning is described on or near station sites and not in the vicinity of alternative alignments.

Appendix 4.2-A provides detailed information on the generalized land use mapping generated using MassGIS data.

4.2.2 Existing Conditions

The following describes the existing land uses and zoning in the South Coast communities along a 0.5-mile wide corridor encompassing each alternative alignment and within a 0.5-mile radius of each proposed station location. The discussion provides a regional overview of existing land use and zoning followed by a discussion of exiting land uses found in the study corridor.

4.2.2.1 Regional Overview of Existing Conditions

Land Use Study Area

The communities that would be served or that could be directly impacted by the Stoughton and/or Whittenton Alternatives are listed in Table 4.2-1. The alternative railroad alignments pass through or near these communities, and new station sites are within or near each. Land use and zoning within each of these communities, relative to the alternative alignments and station sites, is discussed in Section 4.2.2.2.

Southeastern Massachusetts, an area which includes the South Coast region, has been the fastest growing region in the Commonwealth in terms of both population and housing units. As a result, the region has been subject to rapid land development. However, cities such as Fall River and New Bedford have seen their populations decline.

Table 4.2-1 also illustrates the difference in the amount of developable land of the South Coast communities.[7] Based on 2000 MassGIS data, the majority of the land within the South Coast area remains undeveloped (65 percent) and residential (19 percent). The remaining land is agricultural (9 percent), commercial/industrial (3 percent), transportation/utility (2 percent), and recreational (2 percent).

The following sections describe the character of the typical development patterns in the South Coast communities: sparsely developed (suburban/semi-rural) and densely developed (urban).

Sparsely Developed Areas

Suburban development patterns exist in those communities closest to Boston and with good transportation connections to the Boston metropolitan area, such as Canton, Stoughton, and Easton. These communities are served by I-95/Route 128 and the existing commuter rail lines. Semi-rural communities along I-495, including Raynham and Taunton, remain predominantly rural although suburban development has been increasing. The coastal communities south of I-495 (including Freetown) are areas of seasonal residents and visitors, with residential and agricultural land uses. Residential uses within these communities are typically separated from commercial and industrial areas.

Lower-density, single-family residential developments dominate these suburban and semi-rural communities. The majority of residential land use exists along local road networks. Multi-family residential use is generally not common in these areas. However, some proposed station sites close to

[7] For purposes of this analysis, developable land is defined as large parcels of land that could be developed into new subdivisions or new commercial/industrial properties or could be placed into permanent or limited open space protection.

town centers or villages (such as in Easton and Taunton) are in areas that have somewhat higher-density housing, such as two- and three-family properties and small lots.

Commercial and industrial land uses within the region generally follow a sprawling pattern. Although commercial and industrial land uses are in city and town centers, many are also found in non-urban settings along major interstate and state highways, and at interstate exits and interchanges. Many of the largest identified commercial and industrial land use areas are found in non-urban settings away from city and town centers.

Table 4.2-1 Land Use Study Area Communities: Developable Areas

Town	Percent Developable
Canton	23.3
Stoughton	18.0
Easton	40.8
Taunton	31.5
Raynham	49.8
Berkley	N/A
Lakeville	34.4
Freetown	51.5
Fall River	33.1
New Bedford	22.4

Source: MassGIS (2000)
N/A Not Available

Densely Developed Areas

The largest cities in the region are New Bedford and Fall River, both former industrial centers, each with a population just under 100,000. Higher-density, multi-family land uses are present in these cities.

New Bedford has a long history of maritime activity, first rising to prominence in the late eighteenth century as one of the most important cities in the whaling industry. This role lasted through the nineteenth century until the decline of whale populations and the rise of petroleum products caused the industry to collapse. New Bedford remained an important textile manufacturing city into the early twentieth century, until those factories declined and relocated to regions with cheaper labor. Though diminished, manufacturing remains an important economic activity. Maritime commerce is still extremely important, as New Bedford is one of the hubs of the New England fishing industry, consistently rating as one of the busiest fishing ports in the country.

Fall River, built on a large bluff above the Taunton River, climbed to importance during the middle nineteenth century due to the availability of water power on the Quequechan River where it descends the bluff. At its height, Fall River's textile industry was second in the country only to that of Manchester, New Hampshire. Like New Bedford, Fall River suffered greatly with the decline of manufacturing in New England.

In terms of population, the third largest community in the region is Taunton, north of Fall River at the head of the Taunton River estuary. Taunton was historically known as a major city in the silversmith and shipbuilding industries. Manufacturing and electronics remain important industries.

Undeveloped Areas

The region also encompasses large expanses of forested land, as well as agricultural and recreational areas. The recreation and park areas, protected public open space and Areas of Critical Environmental Concern (ACECs) are described in Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*, and the agricultural lands are described in Chapter 4.11, *Farmland Soils*.

Regional and Municipal Land Use Plans

SRPEDD, the regional planning agency serving 27 cities and towns in Southeastern Massachusetts, has taken an active role in conducting studies and analyses for some of the affected communities. In conjunction with the South Coast Rail project and the Southeastern Massachusetts Commuter Rail Task Force, SRPEDD has been working with the cities and towns of the region to identify those areas that are priorities for development and priorities for land protection efforts. SRPEDD has worked with municipal officials and citizens to locate and designate Priority Development Areas (PDAs) and Priority Protection Areas (PPAs) within each community. Mapping and final PDA/PPA reports are complete for all 27 communities in the South Coast Region.[8]

4.2.2.2 Existing Conditions within the Study Corridor

Southern Triangle (Common to All Build Alternatives)

The land uses along the New Bedford Main Line (Figures 4.2-1a-d) are primarily low-density residential and undeveloped in Berkley, and forested and undeveloped land with some low-density residential through Lakeville, Freetown, and northern New Bedford. In southern New Bedford, which is urban in character, the land uses are widely mixed and dense, including high-density residential, commercial, industrial, and some institutional uses. A portion of the New Bedford Main Line runs through Taunton, including the downtown area, adjacent to residential, recreational, commercial, and industrial uses. Additional land uses that occur less frequently along the alignment include mixed use, commercial, agriculture, and municipal- or state-owned land. The most developed area along the New Bedford Main Line is in New Bedford, followed by Taunton and Berkley.

The land uses along the Fall River Secondary (Figures 4.2-2a-c) are predominantly forested, undeveloped, and low-density residential with some industrial parcels through Freetown, and moderate-density residential, undeveloped and recreational through northern Fall River. Once the Fall River Secondary enters downtown Fall River, the land uses are more mixed, including higher-density residential, industrial, and commercial properties. This is the most developed area along the Fall River Secondary. Portions of the corridor through Fall River abut the Taunton River waterfront.

Stoughton Alternative

Land use adjacent to the Stoughton Line (Figures 4.2-3a-e) is predominantly moderate-density residential through Canton, Stoughton, and Easton. The alignment passes through a large industrial area at the Canton/Stoughton boundary and the commercial center of Stoughton. Additional land uses along

[8] Southeastern Regional Planning and Economic Development District (SRPEDD) website. http://www.srpedd.org/PPA-PDA.asp. Accessed on January 2, 2013.

the Stoughton Line in these towns include agricultural, municipal-owned, and forested land (particularly in southern Stoughton and northern Easton). Easton is largely low-density residential and undeveloped land, although high-density urban development is present in downtown Easton. The railroad also passes adjacent to a large recreational parcel (golf courses) and the Southeastern Regional Vocational Technical School. In southern Easton, the alignment crosses through the Hockomock Swamp. In this area, the Hockomock Swamp is largely undeveloped with the exception of electric power transmission infrastructure extending roughly southeast to northwest across the alignment. In Raynham, the Stoughton Line passes through a greater mix of uses, such as commercial, including the former Raynham Greyhound Park, low-density residential, , as well as undeveloped area, including Pine Swamp. The land uses adjacent to the Stoughton Line through Taunton are primarily moderate- to high-density residential, supplemented by a mix of undeveloped, commercial and industrial uses.

Whittenton Alternative

Land uses within 0.5 mile of the Whittenton Alternative are the same as described above for the Southern Triangle and Stoughton Alternative, with the exception of the Whittenton Branch alignment and the Attleboro Secondary segment through downtown Taunton (Figures 4.2-4a-b). In these areas, land uses are predominantly moderate-density residential interspersed with industrial (including a gravel pit), commercial and undeveloped land. As the Whittenton Branch alignment and associated Attleboro Secondary segment pass through downtown Taunton, the nearby land uses are a mix of dense commercial, institutional, and industrial parcels.

Stations

Southern Triangle Stations (Common to All Build Alternatives)

The Southern Triangle includes two rail alignments south of Cotley Junction and the six Southern Triangle stations are therefore common to all build alternatives.

King's Highway Station Site—The King's Highway Station site, in northern New Bedford along the New Bedford Main Line on King's Highway east of Route 140, would serve all of the build alternatives (Figure 4.2-5). The station would occupy part of an approximately 55-acre site that is now a shopping plaza. The traditional strip-style shopping center contains various commercial businesses, including McDonald's, Ocean State Job Lot, Rent-A-Center, H&R Block, Family Dollar, Fashion Bug, Fashion Nails and others. A parking area occupies approximately half of the site. Adjacent uses include two smaller shopping centers and associated parking; one west and south, and one north across King's Highway.

East of the rail alignment, beyond the industrial and commercial uses, is a large residential neighborhood. This moderate-density residential neighborhood contains mostly single-family properties and some two- and three-family properties. West of Route 140 there is another residential neighborhood as well as the New Bedford Regional Airport, additional commercial and industrial uses, and a cemetery.

Zoning at the King's Highway Station site is general industrial (Figure 4.2-6). Zoning near this site is high-density single-family residential and low-density multi-family (R5), mixed use, and general and light industrial.

Whale's Tooth Station Site—The Whale's Tooth Station, at the Whale's Tooth parking lot in New Bedford along the New Bedford Main Line, would serve all of the build alternatives (Figure 4.2-7). This

14-acre site on the New Bedford waterfront was identified as the preferred site in the 2002 Final EIR. The city of New Bedford has constructed a parking lot on the site in anticipation of the rail project. This site is approximately 0.5 mile north of the proposed State Pier Station site. The site is within 0.25 mile of the waterfront and in proximity to downtown New Bedford and the Hicks-Logan redevelopment area.

The Whale's Tooth Station site is currently a municipal parcel, and adjacent parcels are mainly large-scale, maritime-related, industrial uses and undeveloped land to the east, industrial to the south, and commercial and moderate- to high-density residential uses to the west. Within the 0.5-mile radius of the Whales' Tooth Station site, Route 18 serves as a significant barrier between the industrial uses along the mixed-use neighborhood west of Route 18. North of the site, the former Wamsutta Mill building is in the process of being converted into residential units (this land use is not depicted in Figure 4.2-7, which is based on 2005 data). Wamsutta Mills is the first conversion to residential use to occur east of Route 18 within 0.5 mile of the Whale's Tooth Station site.

Zoning at the Whale's Tooth Station is general industrial (Figure 4.2-6). Zoning near this site is high-density single-family residential and low-density multi-family (R5), mixed use, and general and light industrial.

Freetown Station Site—The Freetown Station site, on South Main Street along the Fall River Secondary, would serve all of the build alternatives (Figure 4.2-8). The approximately 18-acre site currently includes both undeveloped and industrial land uses. The developed portion is occupied by a self-storage business. The surrounding land is mainly forested, with some residential and industrial uses. South Main Street is a small road but accommodates significant traffic due to the industrial uses in the area.

Generally, the 0.25-mile radius around the Freetown Station site contains few residential properties. Low-density residential uses are immediately across South Main Street and to the north, which would be sensitive noise or vibration receptors. The low-density residential neighborhood becomes more prominent 0.5 mile north of the site. Between 1 and 2 miles south of the site, at the exit from Route 24, there is a large residential population in apartment and condominium properties.

The Freetown Station site is in proximity to two industrial parks—the proposed Fall River Executive Park and the Riverfront Park—that are projected to provide thousands of jobs.[9] There are industrial parcels north and south of the site, including the Stop & Shop Distribution Center.

Zoning at the Freetown Station site is mixed use (Figure 4.2-9). Zoning near this site is light industrial and mixed use.

Fall River Depot Site—The Fall River Depot Station, 1 mile north of downtown Fall River along the Fall River Secondary at Route 79 and Davol Street, would serve all of the build alternatives (Figure 4.2-10). The proposed station would be on a site bounded by Pearce Street to the north, the existing railroad line to the east, Braylies Street to the south, and North Davol Street to the west. A portion of the site was last in industrial use but is now vacant; other portions include commercial uses. A historic train station, now demolished, was on the site. The northern portion of the site was a foundry, and the Old Colony Depot was occupied by a steel company. The proposed Battleship Cove Station site is approximately 1 mile south of the Fall River Depot Station site.

[9] Massachusetts Executive Office of Transportation and Public Works and Massachusetts Bay Transit Authority, Station Siting Report EOT's Final Recommendations, October 10, 2008.

The adjacent parcels are all commercial; some are vacant. Within the 0.5-mile radius of the Fall River Depot Station site is a dense residential neighborhood to the east, an older shopping plaza to the north, and a redeveloping waterfront across Route 79 to the west. Residential properties immediately east of the railroad line appear to be new or recently upgraded, reflecting ongoing improvements to this neighborhood.

The developing waterfront along Route 79 consists of a mix of uses, including industrial, residential, commercial, municipal, and recreational/open space. The Fall River Depot Station site is somewhat isolated from the waterfront. Connectivity between the site and the waterfront is currently limited to an underpass at President Avenue (one block north of the site).

Zoning at the Fall River Depot Station site is general industrial (Figure 4.2-11). Zoning near this site includes high-density, single-family residential and low- to moderate-density multi-family (R5 and MM), general business, and general and light industrial.

Battleship Cove Station Site—The Battleship Cove Station, an approximately 2.2-acre site along the Fall River Secondary on the Fall River waterfront at the Ponta Delgada Plaza, would serve all of the build alternatives (Figure 4.2-12). The site is a triangular-shaped parcel adjacent to the monument, currently owned by the city of Fall River, between the existing railroad and Water Street. Portions of the site occupy what used to be part of Crab Pond that was filled in ca. 1982; this activity was authorized by Department of the Army Permit No. MA-FALL-80-161, issued by the Corps of Engineers on June 2, 1980. The Fall River Depot Station site (described above) is approximately 1 mile north of the Battleship Cove Station site.

The immediately adjacent parcels are mostly industrial, including a Federal Express Distribution Center and a converted mill building. Commercial and institutional land uses are beyond the industrial uses to the north and southwest. Other uses in the vicinity include a dense residential neighborhood to the east and municipal land to the south. The residential neighborhood contains scattered mixed-use and commercial properties, as well as a few institutions and religious uses.

The Battleship Cove Station site is on the waterfront, close to downtown Fall River, near the Fall River Heritage Park and other tourist attractions such as the Heritage State Park, the Old Colony and Fall River Rail Museum, and the Marine Museum. The waterfront area is characterized by old manufacturing buildings and vacant land that the City would like to redevelop.

Zoning at the Battleship Cove Station site is general industrial (Figure 4.2-11). Zoning near this site includes high-density, single-family residential and low- to moderate-density multi-family (R5 and MM), general business, and general and light industrial.

Taunton Depot Station Site—The Taunton Depot Station (formerly, East Taunton [North]) site is at the rear of Target Plaza off of Route 140 (Figure 4.2-13). The site is currently undeveloped, with half the site cleared and half forested. The 14-acre site is primarily surrounded by forest and undeveloped parcels to the north, west, and south. Target Plaza, east of the site, is a big-box retail site that contains a Target, Home Depot, and other stores. Beyond the railroad alignment to the west is a low-density residential neighborhood.

In addition to undeveloped land, the 0.5-mile radius surrounding this site predominantly consists of residential, agricultural, and commercial (primarily Target Plaza) uses. Residential uses along Route 140

are moderate-density, such as small apartment buildings and townhomes. Single-family residential uses are west of the site.

Zoning at the Taunton Depot Station site is moderate-density, single-family residential (Figure 4.2-14). Zoning near this site is predominantly moderate-density, single-family residential with some general industrial.

Stoughton Alternative Station Sites

In addition to the Southern Triangle, the Stoughton Alternatives would provide commuter rail service from South Station through Stoughton to Canton Junction and Weir Junction. The Stoughton Alternatives have five stations in addition to the Southern Triangle stations described above. This section discusses the land use and zoning at or near the proposed station sites for the Stoughton Alternative.

Stoughton Station Site—As described in Chapter 3, *Alternatives*, the existing Stoughton Station would be relocated to accommodate a second track. The station would be shifted from its present location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing (Figures 4.2-3a and 4.2-3b). The proposed station site is privately owned and is currently occupied by commercial and industrial uses, including warehouses/office space used by the Alpha Chemical Company and property of the Murphy Coal Company (fuel storage and materials handling yard, parking lot, and vehicle repair garage).

The Stoughton Station site is surrounded by developed land in the center of Stoughton. Land uses within 0.5 mile of the relocated Stoughton Station include a mix of industrial, commercial, and residential, along with community facilities such as the Stoughton Public Library.

The Stoughton Station site is located within a general industrial zoning district (Figure 4.2-3a). Surrounding zoning districts include central business and general business districts to the north in the center of Stoughton, a general business district to the east (between the railroad tracks and Washington Street) and several single-family residential zoning districts.

North Easton Station Site—The proposed location for the North Easton Station is off Route 138 near the Easton-Stoughton municipal border (Figure 4.2-15). The site is largely hidden from Route 138, behind an approximately 10-acre retail plaza that is anchored by the Roche Brothers Supermarket. The North Easton Station site is currently undeveloped. New medical buildings have recently been constructed nearby and two additional buildings are planned. In addition to the commercial and offices uses at the shopping plaza, the site is surrounded by forest and undeveloped land.

Residential, forested, and institutional uses are within a 0.5-mile radius of the North Easton Station site. South of the site is a sparsely-settled suburban residential area interspersed with commercial uses. The area north of the site along Route 138 is characterized by a mix of apartments and automobile-oriented commercial uses.

The residential uses near the North Easton Station site are moderate- to low-density characterized by single-family homes south of the site and small apartment buildings west and north of the site. Many of the homes in this area appear new and were most likely built within the last 30 years.

Zoning at the North Easton Station site is general business (Figure 4.2-16). Zoning near this site is almost entirely low-density single-family residential with some general business zoned land in both Stoughton and Easton.

Easton Village Station Site—The Easton Village Station site is south of the historic H.H. Richardson train station (Figure 4.2-17). This site is within Easton Village (downtown Easton). Adjacent land uses are commercial, institutional, undeveloped and industrial. A new 113-unit residential condominium complex is under construction directly west of the historic station. Specifically, these land uses include a restored mill complex that currently contains offices,[10] the former train station (now occupied by the Easton Historical Society), and a municipal park adjacent to Shovel Shop Pond to the east. Residences are located within 0.25 mile of the site.

Within a 0.5-mile radius of the Easton Village Station site is predominantly moderate-density residential development typical of a New England town center. These residences are closely set and generally greater than 50 years old. Other uses in the vicinity include commercial, municipal, and institutional properties, as well as a state-owned property and places of worship/religious institutions. Other properties include a town-owned parking lot, an H.H. Richardson-designed library, and a vacant mill building.

South of the Easton Village Station site, Main Street is characterized by an approximately two-block strip of small, two-, and three-story commercial properties. Many former single-family homes along Main Street have been converted to commercial uses and contain low-intensity professional services such as a doctor's office or realtor. Some of these properties are residential with a home office.

Zoning at the Easton Village Station site is general industrial (Figure 4.2-16). Zoning near this site is almost entirely low-density single-family residential, with small areas of light industrial and general business.

Raynham Park Station Site—The Raynham Park Station is at the former site of the Raynham-Taunton Greyhound Park in Raynham (Figure 4.2-18). The station would be on a portion of this 80-acre site. Although noted as recreational in Figure 4.2-18 due to the race track on the larger site, the specific station site is currently a paved roadway and parking lot, and portions of an industrial operation. The site is currently used as simulcast/off-track betting facility.

The land uses adjacent to the Raynham Park Station site are a mix of forest, recreation, industry, and commercial. The former greyhound park property occupies much of the land in the 0.5-mile radius around the site. North of the site, Route 138 is primarily forested. South of the site, Route 138 has low-density residential uses and an agricultural parcel. Multi-family residential properties are more than 1 mile to the north.

Zoning at the Raynham Park Station site is general industrial (Figure 4.2-19). Zoning near this site is almost entirely general industrial, with some general business and low-density, single-family residential.

Taunton Station (Dean Street) Site—The Taunton Station is at the Dean Street site (Figure 4.2-20). The site is approximately 8 acres and is near Route 44 just north of the historic train station. Downtown Taunton is approximately 0.75 to 1 mile from the site. The site is bounded by Arlington Street, Belmont Street, and the existing railroad and is primarily vacant. Currently, parcels comprising the site are owned

[10] This parcel is noted as institutional on Figure 4.2-16 due to the ownership.

by the city and by private entities. The city-owned parcel was a former rubber plant that burned. The city of Taunton has invested in remediating this Brownfield site in anticipation of a future train station. The two private parcels are:

- A former granite storage facility that partially burned in March 2008. One building and a garage remain on this parcel.

- An undeveloped lot used for storage for a nearby auto-body use on Arlington Street. This parcel is currently vacant and contains debris.

Adjacent parcels are forest to the north and east, residential to the west, and commercial to the south. Industrial, institutional (nursing home), and recreational/municipal (ball fields) properties interspersed with forest are east of the railroad right-of-way, and accessed from Longmeadow Road or Dean Street.

Moderate-density residential is the predominant land use within 0.5 mile of the Taunton Station site, particularly north and west. A few commercial, industrial, religious, and undeveloped parcels are scattered throughout the vicinity. The Taunton River runs south of the site under Route 44. South of the river is a large area containing forest and agricultural land. The residential neighborhoods north and west of the site, the nursing home, and the recreational fields east of the site would be sensitive noise and vibration receptors.

The city of Taunton recently adopted a Transit Development District zoning overlay at this station site; the zoning at the Taunton Station site is mixed-use (Figure 4.2-21). Zoning near this site is almost entirely moderate-density, single-family residential with an area of general industrial, and an area of limited business.

Whittenton Alternatives Station Sites

The Whittenton Alternatives would involve the same stations as the Stoughton Alternatives, with the exception of the Taunton (Dean St.) station that is bypassed by the Whittenton Alternatives alignment. Instead of a station at Dean St., the Whittenton Alternatives would have a station at Dana Street in Taunton along the Attleboro Secondary. Land uses surrounding the proposed Dana Street station are diverse, and include industrial, residential and agricultural uses (Figure 4.2-39). Zoning districts around the station site include a highway business commercial district, residential districts and a conservation district.

Layover Facilities

Two overnight layover facilities are required for the Build alternatives, one each at or near the end of the Fall River Secondary and the New Bedford Main Lines. A total of five alternative sites were identified in the DEIS/DEIR, three for the Fall River Secondary and two for the New Bedford Main Line. Subsequent to the DEIS/DEIR, MassDOT reviewed the alternative sites and identified the Wamsutta site as their preferred alternative for the New Bedford Line and the Weaver’s Cove East site as their preferred alternative for the Fall River Secondary Line. This section provides basic descriptions of each layover facility site and an indication of its location in reference to existing land uses.

Layover facility plans are conceptual at this point, consisting only of general layouts and footprints. Tracks at the train layover facilities would diverge from the respective through lines (Fall River Secondary, or New Bedford Main Line) and consist of a series of short parallel spurs upon which trains

would be parked for overnight layovers and light maintenance work. Parking areas for employees would be included within the facilities, and hooded lights would minimize light pollution. Small site structures are planned for storage and personnel change rooms. The facilities would be fenced and lighted for security. Conceptual designs for these facilities that have been developed subsequent to the DEIS/DEIR are discussed in Chapter 3, *Alternatives* (Section 3.2.16).

Weaver's Cove East Layover Facility Site

The proposed Weaver's Cove East site layover facility (Figure 4.2-22) would be constructed along the east side of the Fall River Secondary and would serve all Build alternatives. It would be located in Fall River west of Main Street between the existing Fall River Secondary and Main Street, approximately 2.5 miles from the southern terminus of the Fall River Secondary.

Currently vacant land, a portion of the Weaver's Cove East site, was previously developed. Approximately one-half of the site is cleared of vegetation or includes remnant building foundations; the remainder of the site is vegetated. Surrounding land to the north, east, and south is residential; industrial land use is present to the southwest. Undeveloped land is immediately west of the site, adjoining the Taunton River. The industrial site to the southwest is a former Shell Oil facility, and consists of completely cleared land with several large aboveground storage tanks and a short shipping dock.

Wamsutta Layover Facility Site

The proposed Wamsutta site layover facility (Figure 4.2-23) would be constructed along the New Bedford Main Line and would serve all Build alternatives. It would be located in New Bedford near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main Line, just north of the Whale's Tooth Station.

The Wamsutta site is a previously developed site, currently used as a rail yard for CSX, within an industrial area. The site is visible from adjacent roads and buildings. Adjoining properties are transportation corridors or industrial in nature. Industrial sites are located north, east, and south of this location, and Route 18 to the west. No commercial or residential properties, or open spaces, are located in close proximity to this site.

4.2.3 Analysis of Impacts

4.2.3.1 No-Build (Enhanced Bus) Alternative

The No-Build Alternative (Enhanced Bus) would improve transit service to Boston from New Bedford, Fall River, and Taunton by adding more buses to existing routes. Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts.

No new construction or land acquisition would be required for the No-Build Alternative. Therefore, the No-Build Alternative would have no direct impacts on land use.

4.2.3.2 Southern Triangle (Common to all Build Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all Build alternatives. These rail lines form a rough triangular shape running south from Myricks Junction to Fall River (the Fall River Secondary) and from Weir Junction through Myricks Junction to New Bedford

(the New Bedford Main Line), and are therefore referred to as the Southern Triangle (Figure 1.4-1). The following sections describe the direct environmental consequences to land uses that may result from new construction for these two common components of the Build alternatives of the South Coast Rail project. The northern part of the South Coast Rail study area is described in subsequent sections for each alternative.

Fall River Secondary

The Fall River Secondary is currently a freight track and would be upgraded and maintained to Federal Rail Administration (FRA) Class 7 options[11] for the South Coast Rail project. The majority of the 12.3-mile-long alignment would be single-track, with a 0.7-mile double-track segment at Myricks Junction and a 1.0-mile double-track section adjacent to the Fall River Golf Club. Three sidings are also proposed in Freetown and Fall River to allow flexibility between commuter and freight operations. The public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the Fall River Secondary is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and two new traction power facilities would need to be constructed for the electric alternatives. Potential direct impacts to land uses resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one new station would be constructed in Freetown (Freetown). One new layover facility would be constructed in Fall River, at the Weaver's Cove East site. Potential direct impacts to land uses resulting from constructing the new stations and layover facilities along the Fall River Secondary are considered below in the Stations and Layover facilities sections.

New Bedford Main Line

The 19.4-mile existing New Bedford Main Line freight track would be upgraded to FRA Class 7 options for the South Coast Rail project. Two tracks would be constructed between Weir Junction and Myricks Junction, and with a 0.9-mile third track for freight movements near Taunton Depot Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 mile. The remainder of the line would be single-track, with the exception of a 1.8-mile double-track section in Freetown and a 1.7-mile section in New Bedford. The existing public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. One public at-grade road/railroad crossing would be closed. The existing freight service using the New Bedford Main Line is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and four or five traction power facilities (depending upon the alternative selected) would be constructed for the electric alternatives. Potential direct impacts to land resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

Two new train stations would be constructed in New Bedford (Whale's Tooth and King's Highway) and one new train station would be constructed in Taunton (Taunton Depot). One new layover facility would be constructed in New Bedford at the Wamsutta site. Potential direct impacts to land uses resulting from constructing and using the new stations and layover facilities along the New Bedford Main Line are considered below.

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[11] FRA. 2009. 49 CFR 213.9 Classes of Track: Operating Speed Limits. U.S. Department of Transportation, Federal Railroad Administration.

Property Acquisition

The number, area, public or private ownership, and general land use of parcels that would be acquired in each municipality along the Fall River Secondary right-of-way and New Bedford Main Line right-of-way (i.e., the Southern Triangle) and for the traction power facilities for the electric alternatives, are summarized in Table 4.2-2 and shown in Figures 4.2-1a-d and 4.2-2a-c.

Table 4.2-2 Southern Triangle Land Acquisition: Fall River Secondary and New Bedford Main Line

Municipality	Public Ownership Area in Acres (number of parcels)	Private Ownership Land Use Area in acres (number of parcels)				
		Residential	Commercial	Industrial	Undeveloped	*Subtotal*
Right-of-Way (All Build Alternatives)						
Berkley	**0.03 (1)**	**5.50 (3)**	**-**	**0.30 (1)**	**0.80 (4)**	***6.60 (8)***
Fall River	**0.85 (1)**	**0.04 (2)**	**-**	**-**	**0.03 (1)**	***0.07 (3)***
Freetown	**0.03 (1)**	**0.12 (4)**	**-**	**-**	**0.01 (1)**	***0.13 (5)***
Lakeville	**-**	**-**	**-**	**-**	**0.16 (4)**	***0.16 (4)***
New Bedford	**0.39 (1)**	**-**	**-**	**0.34 (5)**	**-**	***0.34 (5)***
TOTAL (All Diesel Alternatives)	*1.30 (8)*	*5.66 (9)*	*-*	*0.64 (6)*	*1.00 (10)*	*7.30 (25)*
Traction Power Facilities (All Electric Alternatives)						
Berkley	**0.01 (1)**	**-**	**-**	**-**	**-**	**-**
Fall River	**-**	**-**	**-**	**-**	**0.24 (1)**	***0.24 (1)***
Freetown	**-**	**-**	**-**	**-**	**0.18 (1)**	***0.18 (1)***
Lakeville	**-**	**-**	**-**	**-**	**-**	**-**
New Bedford	**-**	**-**	**-**	**-**	**0.89 (1)**	***0.89 (1)***
TOTAL (Right-of-Way and Traction Power Facilities, All Electric Alternatives)	*1.31 (1)*	*5.66 (9)*	*-*	*0.64 (6)*	*2.31 (13)*	*8.61 (28)*

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The Southern Triangle would require 7.30 acres of land acquisition for the diesel alternatives and 8.61 acres for the electric alternatives. Private property acquisitions include 6.0 acres (17 parcels) for the diesel alternatives, and 7.3 acres (27 parcels) for the electric alternatives. The greatest amount of affected private land along the right-of-way would be residential and undeveloped properties, totaling 5.66 and 1.00 acres, respectively (5.66 and 2.31 acres for the electric alternatives), with minimal impacts to industrial land and no effect on commercial land. Three undeveloped parcels would be affected by the traction power facility sites. The greatest amount of privately-owned land would be acquired in Berkley, and the least in Lakeville. Public property acquisitions include 1.30 acres (8 parcels) for the diesel alternatives, plus an additional 0.01 acre (1 parcel) for the electric alternatives. Public land would be acquired in all affected Southern Triangle municipalities for the right-of-way, with the exception of Lakeville.

Most of the land that would be acquired for the right-of-way or traction power facilities consists of small portions of either publicly or privately owned parcels. No business or community facility displacements would result from the Southern Triangle acquisitions along the Fall River Secondary. Residential displacement would occur in Berkley, from three homes occupying two parcels at Myricks Junction (Figures 4.2-2a). Based on the average Berkley household size of 3.1 persons, nine persons would be displaced by these acquisitions.

The above-mentioned two parcels in Berkley, at Myricks Junction, would be acquired in full. These two parcels are zoned for residential use (but land use is identified as “undeveloped” for one).

4.2.3.3 Stoughton Electric Alternative

The Stoughton Electric Alternative north of the Southern Triangle would be comprised of a portion of the Northeast Corridor and the entire Stoughton Line. This alternative would use the existing Northeast Corridor from South Station to Canton. From Canton Junction, the existing, active Stoughton Line would be used to Stoughton Station. Commuter rail service would be extended, using an out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton, at which point this alignment joins the New Bedford Main Line.

This evaluation focuses on the existing and extended Stoughton Line segment; no construction would be required in the Northeast Corridor segment for this alternative, and the Southern Triangle segments were addressed above.

The existing Stoughton Line commuter rail double track from Canton Junction to Stoughton Station, a distance of 3.8 miles, would be upgraded to FRA Class 7 for the Stoughton Electric Alternative. A new double track would extend south of Stoughton Station to the proposed North Easton Station. The remainder of the line south to Weir Junction would be single- track, with a 2.2-mile long double-track section in Raynham, and a 0.6-mile long double-track section in Taunton. Approaching Weir Junction, an additional 0.4 mile siding track would be provided for freight use only. Weir Junction would also be reconfigured to accommodate four tracks as well as 45 MPH for operations through the curve while maintaining existing rail connections. A frontage road would be constructed in Stoughton connecting to Morton Street to eliminate multiple grade crossings, and a new grade-separated crossing is proposed at Route 138 in Raynham. All other existing at-grade road/railroad crossings would be reconfigured and/or improved to meet current safety standards. New catenary supports and wires would be constructed along the length of the line, and three new traction power facilities would be constructed. Potential direct impacts to land uses resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

One existing train station (Canton Center) along the active portion of the Stoughton Line would be reconstructed. The existing Stoughton station would be deactivated and a new Stoughton station would be constructed south of the existing station. A total of five new train stations (Stoughton, North Easton, Easton Village, Raynham Park, and Taunton) would be constructed. No new layover facilities would be constructed along this segment. Potential direct impacts to land uses from reconstructing the existing and developing the new stations along the Stoughton Line are considered below.

Property Acquisition

The number, area, public or private ownership, and general land use of parcels that would be acquired in each municipality along the Stoughton Line right-of-way and for the traction power facilities for the Stoughton Electric Alternative are summarized in Table 4.2-3 and shown in Figures 4.2-3a-e.

Table 4.2-3 Stoughton Alternatives: Land Acquisition

Municipality	Public Ownership Area in Acres (number of parcels)	Private Ownership Land Use Area in acres (number of parcels) Residential	Commercial	Industrial	Undeveloped	Subtotal
Right-of-Way (Stoughton Alternatives)						
Berkley	**<0.1 (1)**	**5.5 (3)**	-	**0.3 (1)**	**0.8 (4)**	***6.6 (8)***
Canton	-		**0.1 (1)**	-	--	***0.1 (1)***
Easton	**0.2 (1)**	-	-	-	-	-
Fall River	**0.9 (1)**	**<0.1 (2)**	-	-	**<0.1 (1)**	***<0.1 (3)***
Freetown	**<0.1 (1)**	**0.1 (4)**	-	-	**<0.1 (1)**	***0.1 (5)***
Lakeville	-	-	-	-	**0.2 (4)**	***0.2 (4)***
New Bedford	**0.4 (1)**	-	-	**0.3 (5)**	-	***0.3 (5)***
Raynham	-	**7.4 (10)**	**0.3 (2)**	**9.8 (3)**	**9.5 (8)**	***27.0 (23)***
Stoughton	**0.7 (4)**	**0.7 (2)**	**0.4 (4)**	-	**2.4 (6)**	***3.5 (12)***
Taunton	**1.9 (4)**	**2.0 (11)**	**0.1 (3)**	**1.4 (3)**	**2.3 (2)**	***5.8 (19)***
TOTAL (Stoughton Diesel Alternative)	*4.1 (13)*	*15.7 (32)*	*0.9 (10)*	*11.8 (12)*	*15.2 (26)*	*43.6 (80)*
Traction Power Facilities (Stoughton Electric Alternative)						
Berkley	**<0.1 (1)**	-	-	-	-	-
Canton	-	-	-	-	**0.5 (1)**	***0.5 (1)***
Easton	**1.1 (1)**	-	-	-	-	-
Fall River	-	-	-	-	**0.2 (1)**	***0.2 (1)***
Freetown	-	-	-	-	**0.2 (1)**	***0.2 (1)***
New Bedford	-	-	-	-	**0.2 (1)**	***0.2 (1)***
Taunton	-	**<0.1 (2)**	-	**<0.1 (1)**	-	***<0.1 (3)***
TOTAL (Right-of-Way and Traction Power Facilities, Stoughton Electric Alternative)	*5.2 (15)*	*<15.8 (34)*	*0.9 (10)*	*<11.9 (13)*	*16.3(30)*	*44.7 (87)*

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

This segment would require 43.6 acres (80 parcels) of privately owned land for the right-of-way, plus an additional 1.1 acres (7 parcels) for traction power facilities. The majority of the affected private land along the Stoughton Line right-of-way would be undeveloped property, totaling 16.3 acres, with some impacts to industrial and residential land and little impacts to commercial land. The most area of private land would be acquired in Raynham, with less land acquired in Berkley, Taunton, and Stoughton, and little land acquired in Lakeville, Freetown, New Bedford, Fall River or Canton, and no private land

acquisition in Easton. Moderate areas of undeveloped land would be acquired for traction power facilities in Canton, Freetown, New Bedford, and Fall River, and for the Frontage Road in Stoughton.

Public property acquisitions include 4.1 acres (13 parcels) for the diesel alternatives, plus an additional 1.1 acre (2 parcels) for the electric alternatives. Some public land would be acquired for the right-of-way and traction power facilities in Berkley, Freetown, New Bedford, Fall River, Easton, Stoughton and Taunton. No public land would be affected in Canton, Lakeville or Raynham, where a utility corridor owned by Taunton Municipal Power & Light occupies the former Stoughton track right-of-way.[12] No business or community facility displacements would result from these acquisitions along the Stoughton Line. Residential displacement would occur in Raynham, from one home occupying one parcel south of Raynham Junction (Figure 4.2-3d). Based on the average Raynham household size of 2.8 persons, three persons would be displaced by this acquisition.

Two parcels in Raynham, near Raynham Junction, would be acquired in full. These two parcels are zoned for residential use (but land use is identified as “forest” and “residential”). The residential displacement noted above would be from one of these parcels.

Most of the land that would be acquired for the Stoughton Line right-of-way or traction power facilities consists of small portions of either publicly or privately owned parcels. Eight of the privately owned parcels that would be acquired for the Stoughton Line right-of-way would be acquired in full.

4.2.3.4 Stoughton Diesel Alternative

The Stoughton Diesel Alternative is identical to the Stoughton Electric Alternative with the exception of the locomotive power source. Diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure. Traction power facilities would not be necessary, and the footprint of the area impacted is therefore smaller. The right-of-way subtotal in Table 4.2-3 and areas outlined in Figures 4.2-3a-e show parcel acquisition required for the Stoughton Diesel Alternative.

This segment would require 43.6 acres (80 parcels) of privately owned land and 4.1 acres (13 parcels) of publicly owned land (see Table 4.2-3). The majority of the affected private land along the Stoughton Line right-of-way for the Stoughton Diesel Alternative would be residential property, totaling 15.7 acres (32 parcels). There would be similar impacts to undeveloped property, totaling 15.2 acres (26 parcels), as well as some impacts to industrial land and minor impacts to commercial land. The most area of private land would be acquired in Raynham, with considerably less land acquired in Berkley, Stoughton and Taunton, little land acquired in Lakeville, Freetown, New Bedford, Fall River or Canton, and no private land acquisition in Easton. All other aspects of the Stoughton Diesel Alternative relevant to land uses are the same as for the Stoughton Electric Alternative described in Section 4.2.3.3, above.

4.2.3.5 Whittenton Electric Alternative

The Whittenton Electric Alternative is a variant of the Stoughton Electric Alternative alignment. At Raynham Junction near the southern end of the Stoughton Line, the route would divert to the southwest, following the out-of-service Whittenton Branch. A single track would be constructed along this right-of-way, for a distance of 3.6 miles. The Whittenton Branch connects with the Attleboro Secondary at Whittenton Junction in Taunton; the Attleboro Secondary continues toward the southeast to connect with the New Bedford Main Line at Weir Junction. On this portion of the Attleboro Secondary, 2.2 miles of single-track would be reconstructed, with a 0.3-mile siding reserved for the

[12] The power line would be relocated within the rail corridor or relocated to Route 138.

proposed Dana Street Station. The southernmost portion of the Stoughton Line, from Raynham Junction to Weir Junction (a distance of 5.1 miles), would be not be used if this alternative is selected. This evaluation focuses on the Whittenton Branch and Attleboro Secondary components; other components of this alternative are described above in Sections 4.2.3.2 and 4.2.3.3 (north of Raynham Junction only). New track would be placed on the out-of-service Whittenton Branch railroad bed from Raynham Junction to Whittenton Junction. The existing public at-grade road/railroad crossings would be reconfigured and/or improved to current safety standards. New catenary supports and wires would be constructed along the length of the line. Potential direct impacts to land uses resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

No traction power facilities would be constructed along the Whittenton Branch; a traction power facility required for this alternative would be constructed within the Attleboro Secondary segment. No new stations would be constructed within the Whittenton Branch portion; one new station (Dana Street) would be constructed in Taunton on the Attleboro Secondary segment. No new layover facilities would be constructed along either segment. Land acquisition requirements along the portion of the Attleboro Secondary of the Whittenton Alternative, as noted in the DEIS/DEIR, have been eliminated (other than those related to the Dana Street Station described separately in the section on station property acquisition impacts).

Property Acquisition

The number, area, public or private ownership, and general land use of parcels that would be acquired for the Whittenton Alternatives are shown in Table 4.2-4 and Figures 4.2-4a-b. Table 4.2-4 summarizes the parcels by municipality to be acquired that would be used for the Whittenton Alternatives.

For the right-of-way and traction power facilities, the Whittenton Electric Alternative would require 54.4 acres (83 parcels) of privately owned land from the combination of the Whittenton Branch, the northern portion of the Stoughton Line, and the southeastern portion of the Attleboro Secondary. No residential, business, or community facility displacements would result from these small acquisitions. Although the Whittenton Branch is owned by the Commonwealth, minor acquisitions would be needed along the right-of-way to accommodate ancillary facilities, including traction power facilities. The majority of the affected private land along the Whittenton Branch right-of-way would be undeveloped property, totaling 17.1 acres (32 parcels), with some impacts to residential, commercial or industrial land. The most area of private land would be acquired in Raynham, with considerably less land acquired in Berkley, Taunton and Stoughton, and little land acquired in Canton, Lakeville, Freetown, New Bedford and Fall River.

The Whittenton alternatives would require the acquisition of 3.3 acres (11 parcels) of public land. No public land would be acquired in Canton, Raynham, Taunton, and Lakeville, but would be acquired in the other municipalities along the Whittenton Branch, the northern portion of the Stoughton Line, and the southeastern portion of the Attleboro Secondary. Moderate areas of undeveloped land would be acquired for traction power facilities in Canton, and less land would be acquired for power facilities in Taunton, Freetown, New Bedford, and Fall River.

All property that would be acquired for the Whittenton Branch or relevant segments of the Stoughton Line and Attleboro Secondary right-of-way, or the traction power facilities along the Stoughton Line and Attleboro Secondary, consists of small portions of either publicly or privately owned parcels.

Table 4.2-4 Whittenton Alternatives: Land Acquisition

Municipality	Public Ownership Area in Acres (number of parcels)	Private Ownership Land Use Area in acres (number of parcels)				
		Residential	Commercial	Industrial	Undeveloped	Subtotal
Right-of-Way (Whittenton Alternatives: Whittenton Branch, Stoughton Line & Attleboro Secondary)						
Berkley	**<0.1 (1)**	**5.5 (3)**	**-**	**0.3 (1)**	**0.8 (4)**	**6.6 (8)**
Canton	**-**	**-**	**0.1 (1)**	**-**	**-**	**0.1 (1)**
Easton	**0.2 (1)**	**-**	**-**	**-**	**-**	**-**
Fall River	**0.9 (1)**	**<0.1 (2)**	**-**	**-**	**<0.1 (1)**	**<0.1 (3)**
Freetown	**<0.1 (1)**	**0.1 (4)**	**-**	**-**	**<0.1 (1)**	**0.1 (5)**
Lakeville	**-**	**-**	**-**	**-**	**0.2 (4)**	**0.2 (4)**
New Bedford	**0.4 (1)**	**-**	**-**	**0.3 (5)**	**-**	**0.3 (5)**
Raynham	**-**	**7.4 (10)**	**8.5 (3)**	**9.8 (3)**	**12.5 (9)**	**38.2 (25)**
Stoughton	**0.7 (4)**	**0.7 (2)**	**0.4 (4)**		**2.4 (6)**	**3.5 (12)**
Taunton	**-**	**-**	**-**	**4.2 (10)**	**0.1 (3)**	**4.3 (13)**
TOTAL (Whittenton Diesel Alternative)	**2.2 (9)**	**13.7 (21)**	**9.0 (8)**	**14.6 (19)**	**16.0 (28)**	***53.3 (76)***
Traction Power Facilities (Whittenton Electric Alternative)						
Berkley	<0.1 (1)	-	-	-	-	-
Canton	-	-	-	-	0.5 (1)	0.5 (1)
Easton	1.1 (1)	-	-	-	-	-
Fall River	-	-	-	-	0.2 (1)	0.2 (1)
Freetown	-	-	-	-	0.2 (1)	0.2 (1)
New Bedford	-	-	-	-	0.2 (1)	0.2 (1)
Taunton	-	0.1 (2)	-	<0.1 (1)	-	<0.1 (3)
TOTAL (Right-of-Way and Traction Power Facilities, Whittenton Electric Alternative)	3.3 (11)	13.7 (23)	9.0 (8)	14.6 (20)	17.1 (32)	54.4 (83)

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

4.2.3.6 Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. As described above for the Stoughton Diesel Alternative, diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure, and thus requires a smaller footprint. In the Southern Triangle and along the Stoughton Line (north of Raynham Junction only), the land acquisition impacts of the Whittenton Diesel Alternative would be the same as described for the Stoughton Diesel Alternative. Along the Whittenton Branch, impacts of the Whittenton Diesel Alternative are anticipated to be a similar negligible amount (0.2 acre on 4 parcels). The right-of-way subtotal in Table 4.2-4 and areas outlined in Figures 4.2-4a-b show parcel acquisition required for the Whittenton Diesel Alternative.

The Whittenton Alternatives would require 53.3 acres (76 parcels) of privately owned land and 3.3 acres (11 parcels) of publicly owned land (see Table 4.2-4). The majority of the affected private land along the Whittenton Line right-of-way for the Whittenton Diesel Alternative would be undeveloped property, totaling 16.0 acres (28 parcels). There would be lesser impacts to industrial, residential, and commercial property, and minor impacts to public land. All other aspects of the Whittenton Diesel Alternative relevant to land uses are the same as for the Whittenton Electric Alternative described in Section 4.2.3.5, above.

4.2.3.7 Stations

This section provides basic descriptions of each train and/or bus station and a list of the parcels to be acquired, in whole or in part, to construct or reconstruct these stations for the South Coast Rail project.

Battleship Cove

The Battleship Cove Station would be a new train station constructed along the Fall River Secondary that would serve all Build alternatives. It would be located on Water Street in Fall River, near the southern terminus of the Fall River Secondary (Figure 4.2-24).

The Battleship Cove Station site is a previously developed parcel that is within the Ponta Delgada Plaza. This station would require 0.28 acre (1 parcel) of publicly owned land that MassDOT plans to lease, rather than acquire, from the city of Fall River (parcel number Y-1-3); therefore, no land acquisition would be required for constructing the Battleship Cove Station (Figure 4.2-3b), and there would be no direct effects to land use at this location. No residential, business, or community facility displacements would result from this acquisition for the Battleship Cove Station.

Canton Center

The Canton Center Station is an existing train station along the Stoughton Line that would serve the all Build Alternatives. It is located at 710 Washington Street in Canton. This station would be reconstructed; it would be modified to accommodate a second track. No land acquisition would be required for reconstructing the Canton Center Station (Figure 4.2-25). There would be no direct effects to land at this location.

Canton Junction

The Canton Junction Station is an existing train station at the junction of the Stoughton Line and the Northeast Corridor which would serve all Build alternatives. It is located at the intersection of Beaumont and Sherman Streets in Canton. No land acquisition would be required for the Canton Junction Station (Figure 4.2-26). There would be no direct effects to land uses at this location.

Dana Street Station (Whittenton Alternatives)

The Dana Street Station in Taunton would be a new train station constructed along the Attleboro Secondary that would serve the Whittenton Alternatives. It would be located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton.

The Dana Street Station site in Taunton is currently a vacant lot. The parcels that would be acquired and converted to transportation/utilities land use to construct the Dana Street Station are listed in Table 4.2-5 and shown in Figure 4.2-40.

Table 4.2-5 Downtown Taunton Dana Street Station: Land Acquisition

Parcel Number	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
54-171	Industrial	Industrial	0.56	49
54-448	Residential	Industrial	0.44	100
54-449	Residential	Industrial	0.45	100
54-450	Residential	Industrial	0.47	100
54-451	Residential	Industrial	0.48	100
54-452	Residential	Industrial	0.50	100
54-453	Residential	Industrial	0.49	100
54-454	Residential	Industrial	0.35	100
54-455	Residential		0.35	100
Total			4.09	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The Dana Street Station in would require 100 percent acquisition of 3.53 acres encompassing eight parcels of privately owned land, as well as 49 percent acquisition of one parcel measuring 0.56 acre. These parcels are vacant or appear to have an industrial use, but they are zoned as residential properties. No residential, business, or community facility displacements would result from this acquisition for the Dana Street Station in Taunton.

Easton Village

The Easton Village Station would be a new train station constructed along the Stoughton Line that would serve the Build Alternatives. The Easton Village Station site is on Sullivan Avenue at the transition point to Mechanic Street (near the intersection with Pond Street) in Easton.

The Easton Village Station site is an undeveloped parcel surrounded by industrial and residential development. The land is currently used as a parking lot. No land acquisition would be required for constructing the Easton Village Station (Figure 4.2-3b), and there would be no direct effects to land use at this location.

Fall River Depot

The Fall River Depot Station would be a new train or bus station constructed along the Fall River Secondary to serve all Build alternatives. It would be located near the intersection of North Davol Street and Pearce Street in Fall River.

The Fall River Depot Station site is a previously developed parcel including and surrounded by commercial and industrial development. Parcels that would be acquired and converted to transportation/utilities land use to construct the Fall River Depot Station are listed in Table 4.2-6 and shown in Figure 4.2-28.

The Fall River Depot Station would require 5.11 acres of land, comprised of 4.94 acres (16 parcels) of privately owned land and 0.17 acre (1 parcel) of publicly owned land. Business displacements would result from these acquisitions. Commercial or industrial buildings on five of the parcels listed above would be acquired to construct this station. No residential or community facility displacements would result from these acquisitions for the Fall River Depot Station.

Parcel number O-15-20 is owned by the city of Fall River; all other parcels are privately owned and would be acquired in whole.

Table 4.2-6 Fall River Depot Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
O-15-1	Private	Industrial	Industrial	**0.80**	**100.0**
O-15-2	**Private**	**Industrial**	Industrial	**0.32**	**100.0**
O-15-8	Private	Industrial	Industrial	**0.19**	**100.0**
O-15-9	Private	Commercial	Industrial	**0.07**	**100.0**
O-15-10	Private	Industrial	Commercial	**0.12**	**100.0**
O-15-18	Private	Industrial	Industrial	**1.52**	**100.0**
O-15-20	**Public**	**Industrial**	Industrial	**0.17**	**100.0**
O-15-31	**Private**	**Industrial**	**Undeveloped**	**0.03**	**100.0**
O-15-32	**Private**	**Industrial**	**Industrial**	**0.35**	**100.0**
O-15-34	**Private**	**Industrial**	**Industrial**	**0.04**	**100.0**
O-22-5	**Private**	**Commercial**	**Commercial**	**0.12**	**100.0**
O-22-6	**Private**	**Residential**	**Residential**	**0.10**	**100.0**
O-22-7	**Private**	**Residential**	**Commercial**	**0.12**	**100.0**
O-22-8	Private	Commercial	**Commercial**	**0.53**	**100.0**
O-22-11	Private	Commercial	**Industrial**	**0.47**	**100.0**
O-22-16	Private	Commercial	Commercial	0.12	**100.0**
O-22-17	Private	Commercial	Commercial	0.04	**100.0**
TOTAL				**5.11**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
1 Parcels O-15-0009 and O-15-0010 are included with Parcel O-15-0008 in Fall River assessor records.
2 Parcel O-22-0017 is included with Parcel O-22-0005 in Fall River assessor records.

Freetown

The Freetown Station would be a new train or bus station constructed along the Fall River Secondary to serve all Build alternatives. It would be located along South Main Street in Freetown.

The Freetown Station site is a previously developed parcel surrounded by low density residential development and undeveloped land. The parcel that would be acquired and converted to transportation/utilities land use to construct the Freetown Station is listed in Table 4.2-7 and shown in Figure 4.2-29.

Table 4.2-7 Freetown Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
233-19	Private	Commercial	Undeveloped	4.18	15

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.

The Freetown Station would require acquisition of 4.18 acres (1 parcel, parcel 233-19) of privately owned land. No residential, business, or community facility displacements would result from this acquisition for the Freetown Station. Less than 50 percent of parcel number 233-19 would be acquired for the Freetown Station.

King's Highway

The King's Highway Station would be a new station constructed along the New Bedford Main Line to serve all Build alternatives. It would be located near the intersection of King's Highway and Tarkiln Hill Road in northern New Bedford.

The King's Highway Station site is a previously developed parcel surrounded by industrial development. This station would share a parking lot with adjacent businesses; no land acquisition would be required (Figure 4.2-30). There would be no direct effects to land uses at this location.

North Easton

The North Easton Station would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. It would be located at 21 Washington Street in Stoughton, behind the Roche Brothers Plaza.

The North Easton Station site is an undeveloped parcel surrounded by commercial development. Parcels that would be acquired and converted to transportation/utilities land use to construct the North Easton Station are listed in Table 4.2-8 and shown in Figure 4.2-31.

The North Easton Station would require 8.81 acres (6 parcels) of privately owned land. No residential, business, or community facility displacements would result from these acquisitions for the North Easton Station.

Table 4.2-8 North Easton Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
1U-1-1	Private	Residential	**Undeveloped**	**1.65**	**8.0**
1U-1-48	Private	Commercial	Undeveloped	**1.00**	**27.0**
060-006	Private	Commercial	Undeveloped	**6.31**	**100.0**
060-008	Private	Commercial	Commercial	**0.59**	**15.0**
060-009	Private	Commercial	Commercial	**0.69**	**20.0**
TOTAL				**10.24**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.
Note Additional property tax revenue losses may result from small and/or partial acquisitions that cannot be determined at this phase.

Less than 50 percent of parcel numbers 1U-1-1, 1U-1-48, 060-006, 060-008, and 060-009,would be acquired. More than 50 percent of parcel number 060_006 would be acquired.

Raynham Park

The Raynham Park Station would be a new train station constructed along the Stoughton Line that would serve the Stoughton or Whittenton Alternatives. It would be located at 1958 Broadway in Raynham, at the former Raynham Park Greyhound Track.

The Raynham Park site is a developed parcel surrounded by recreational development and undeveloped land. Parcels that would be acquired and converted to transportation/utilities land use to construct the Raynham Park Station are listed in Table 4.2-9 and shown in Figure 4.2-32.

The Raynham Park Station would require 11.90 acres (2 parcels) of privately owned land. Commercial buildings on parcel number 1-19-1 would be acquired to construct this station. The business present on this parcel is Raynham Park Simulcast Center. A proposal for developing a slots parlor casino on the Simulcast Center property exists at the time of the preparation of the FEIS/FEIR, but the outcome of this proposal is uncertain as there is a competitive process to determine the location of the new casino.[13] No residential, business, or community facility displacements would result from the property acquisitions for the Raynham Park Station.

Table 4.2-9 Raynham Park Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
1-15	**Private**		**Commercial**	**3.09**	**34.0**
1-19-1	**Private**		**Commercial**	**8.81**	**59.0**
TOTAL				**11.90**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.
Note Additional property tax revenue losses may result from small and/or partial acquisitions that cannot be determined at this phase.

Less than 50 percent of parcel number 1-15 would be acquired. More than 50 percent of parcel number 1-19-1 would be acquired.

Stoughton

The Stoughton Station would be a new train station along the Stoughton Line that would serve all Build Alternatives. In order to accommodate a second track, the existing Stoughton Station would be shifted from its location between Porter and Wyman Streets to a new location south of the Wyman Street at-grade crossing.

Land uses and zoning designations of the parcels that would be acquired to reconstruct the Stoughton Station are listed in Table 4.2-10 and shown in Figure 4.2-33.

Table 4.2-10 Stoughton Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
053-101	**Private**	**Industrial**	**Industrial**	**1.05**	**100**
053-102	**Private**	**Industrial**	**Commercial**	**4.42**	**100**
054-110	Private	Commercial	Commercial	0.04	2
054-401	Private	Commercial	Commercial	0.01	10
054-406	**Private**	**Industrial**	**Industrial**	**1.90**	**100**
054-407	Private	Industrial	Undeveloped	0.02	10
TOTAL				**7.44**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various)

The Stoughton Station would require 7.44 acres of privately owned industrial, undeveloped and commercial land. Four parcels would be obtained in entirety; 10 percent or less of two other parcels

[13] http://www.bostonglobe.com/metro/2013/06/11/raynham-park-strikes-deal-with-town-over-slot-machine-parlor/1QLjMn7wbBFwoq505pvoeL/story.html

would be acquired. No residential or community facility displacements would result from this acquisition of land for the Stoughton Station. Business displacements would occur and job losses may result on Parcels 053-101, 053-102 and 054-406. A small portion of the parking lot on Parcel 054-110 would be acquired, with no business displacement or job loss. The other two parcels are undeveloped or vacant; business displacements or job losses would not result from acquiring these parcels.

Relocating the Stoughton Station to the Preferred Alternative site would open up 2.5 acres of land for potential redevelopment. MBTA owns this property and it would be released for sale and redevelopment. This land, currently occupied by tracks and parking areas, is on the east side of the proposed tracks.

Taunton (Stoughton Alternatives)

The Taunton Station would be a new train station constructed along the Stoughton Line that would serve the Stoughton Alternatives. It would be located along Arlington Street near Dean Street (Route 44), adjacent to a historic train station in Taunton.

The Taunton Station site is a previously developed parcel surrounded by commercial development. Parcels that would be acquired and converted to transportation/utilities land use to construct the Taunton Station are listed in **Table** 4.2-11 and shown in Figure 4.2-34.

Table 4.2-11 Taunton Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
55-759	Private	Industrial	Undeveloped	1.53	100.0
55-760	Private	Industrial	Undeveloped	7.44	100.0
55-761	Private	Industrial	Undeveloped	0.51	100.0
55-762	Private	Industrial	Undeveloped	0.50	100.0
55-763	Private	Industrial	Undeveloped	0.25	100.0
55-764	Private	Industrial	Undeveloped	0.64	100.0
Pub-ROW	Public	Industrial	Undeveloped	0.95	100.0
TOTAL				**11.82**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The Taunton Station would require 11.82 acres of land, comprised of 10.87 acres (6 parcels) of privately owned land and 0.95 acre (1 parcel) of publicly owned land. No residential, business, or community facility displacements would result from these acquisitions for Taunton Station.

Parcel number Pub-ROW is owned by the city of Taunton. All seven parcels would be wholly acquired.

Taunton Depot

The Taunton Depot Station would be a new train station constructed along the New Bedford Main Line that would serve all Build alternatives. It would be located at 872 County Street in Taunton, behind the existing Target plaza.

The Taunton Depot Station site is an undeveloped parcel adjacent to commercial development and undeveloped lands. Parcels that would be acquired and converted to transportation/utilities land use to construct the Taunton Depot Station are listed in Table 4.2-12 and shown in Figure 4.2-35.

Table 4.2-12 Taunton Depot Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Area (acres)	Percent Acquisition
107-47	Private	Residential	Commercial	0.56	100.0
107-48	Private	Industrial	Undeveloped	10.97	40.0
TOTAL				**11.53**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The Taunton Depot Station would require 11.53 acres (2 parcels) of privately owned land. No residential, business, or community facility displacements would result from these acquisitions for the Taunton Depot Station.

Less than 50 percent of parcel number 107-57 would be acquired for the Taunton Depot. Parcel number 107-47 would be wholly acquired.

Whale's Tooth

The Whale's Tooth Station would be a new train station constructed along the New Bedford Main Line constructed to serve all Build alternatives. It would be located near the intersection of Acushnet Avenue and Hillman Street, near the southern terminus of the New Bedford Main Line.

The Whale's Tooth Station site is a previously developed parcel surrounded by industrial development. The city of New Bedford recently constructed a parking lot at this site in anticipation of the proposed South Coast Rail project. No land acquisition would be required for constructing the Whale's Tooth Station (Figure 4.2-3b), and there would be no direct effects to land use at this location (Figure 4.2-36).

4.2.3.8 Layover Facilities

Two overnight layover facilities are planned for the Southern Triangle: one each at or near the end of the Fall River Secondary and the New Bedford Main Line. The Wamsutta site was selected as layover facility for the New Bedford Main Line and Weaver's Cove East was selected for the Fall River Secondary (see Chapter 3). This section provides basic descriptions of each of the selected layover facility sites and a list of the parcels to be acquired, in whole or in part, to construct these facilities for the South Coast Rail project.

Wamsutta

The Wamsutta site layover facility would be constructed along the New Bedford Main Line and would serve all Build alternatives. It would be located in New Bedford near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main Line, just north of the Whale's Tooth Station.

The Wamsutta site layover facility alternative location is a previously developed site, currently used as a rail yard for CSX, within an industrial area. The parcel that would be acquired to construct a layover facility at the Wamsutta site is shown in Figure 4.2-37.

The layover facility at the Wamsutta site would require 5.90 acres (1 parcel) of publicly owned land. No residential, business, or community facility displacements would result from this acquisition for the Wamsutta site. Parcel number 72-275 is owned by Housing 70 Corporation (the city of New Bedford).

Weaver's Cove

The Weaver's Cove site layover facility would be constructed along the Fall River Secondary and would serve all Build alternatives. It would be located in Fall River west of Main Street between the existing Fall River Secondary and Main Street, approximately 2.5 miles from the southern terminus of the Fall River Secondary.

Currently vacant land, a portion of the Weaver's Cove East site was previously developed. Approximately one-half of the site is cleared of vegetation or includes remnant building foundations; the remainder of the site is vegetated. Surrounding land to the north, east, and south is residential; industrial land use is present to the southwest. Undeveloped land is immediately west of the site, adjoining the Taunton River. The land acquisition necessary to construct a layover facility at the Weaver's Cove East site is shown in Figure 4.2-38.

The layover facility at the Weaver's Cove site would require 18.43 acres (2 parcels) of privately owned land.

More than 50 percent of parcel number T-15-33 would be acquired. Parcel numberT-1-38 would be wholly acquired. Parcel T-15-0033 incorporates Parcel T-15-1 in the city of Fall River Assessor's records. Figure 4.2-38 depicts both parcels.

Summary of Layover Facility Effects

Table 4.2-13 summarizes the land acquisition for the layover facility sites. Private land acquisition would range from 0.0 acres for the Wamsutta site to 18.43 acres for the Weaver's Cove site. The Wamsutta site would require an acquisition of 5.90 acres (1 parcel) of public land.

Table 4.2-13 Summary of Layover Facility Land Acquisition

Layover Facility Site	Public Ownership Area in acres (number of parcels)	Private Ownership Land Use Area in acres (number of parcels)				
		Residential	Commercial	Industrial	Undeveloped	Subtotal
Wamsutta Site	5.90 (1)	-	-	-	5.90 (1)	5.90 (1)
Weaver's Cove Site	-	-	-	-	18.43 (2)	18.43 (2)

4.2.3.9 Summary

The Build Alternatives would all require property acquisitions outside existing rights-of-way to accommodate the new stations and rail infrastructure. Summary tables of property impacts by municipality for the Stoughton Alternatives (Diesel and Electric) and Whittenton Electric Alternative are provided in Tables 4.2-14 and 4.2-15, respectively. The total acreage of land use impacts of the Stoughton Alternatives (134.5 to 136.7 acres) is slightly greater than the total acreage of land use impacts of the Whittenton Alternatives (134.6 to 136.8 acres). The electric versions of each of the rail alternatives require slightly larger amounts of land acquisition than the diesel versions because of the need for traction power substations with the electric alternatives. Property acquisitions and compensation of affected property owners would be conducted in accordance with federal and state requirements.

Table 4.2-14 Stoughton Alternatives: Land Acquisition Summary by Municipality

Municipality	Public Ownership Area in acres (number of parcels)	Private Ownership Land Use Area in acres (number of parcels)				
		Commercial	Industrial	Residential	Undeveloped	Subtotal
Alignment						
Canton	-	0.1 (1)	-	-	-	0.1 (1)
Stoughton	0.7 (4)	0.4 (4)	-	0.7 (2)	2.4 (6)	3.5 (12)
Easton	0.2 (1)	-	-	-	-	-
Raynham	-	0.3 (2)	9.8 (3)	7.4 (10)	9.5 (8)	27.0 (23)
Taunton	1.9 (4)	0.1 (3)	1.4 (3)	2.0 (11)	2.3 (2)	5.8 (19)
Berkley	<0.1 (1)	-	0.3 (1)	5.5 (3)	0.8 (4)	6.6 (8)
Lakeville	-	-	-	-	0.2 (4)	0.2 (4)
Freetown	<0.1 (1)	-	-	0.1 (4)	<0.1 (1)	0.1 (5)
New Bedford	0.4 (1)	-	0.3 (5)	-	-	0.3 (5)
Fall River	0.9 (1)	-	-	<0.1 (2)	<0.1 (1)	<0.1 (3)
Subtotal	4.1 (13)	0.9 (10)	11.8 (12)	15.7 (32)	15.2 (26)	43.6 (80)
Traction Power Substations						
Canton	-	-	-	-	0.5 (1)	0.5 (1)
Easton	1.1 (1)	-	-	-	-	-
Taunton	-	-	<0.1 (1)	<0.1 (2)	-	<0.1 (3)
Berkley	<0.1 (1)	-	-	-	-	-
Freetown	-	-	-	-	0.2 (1)	0.2 (1)
New Bedford	-	-	-	-	0.2 (1)	0.2 (1)
Fall River	-	-	-	-	0.2 (1)	0.2 (1)
Subtotal	1.1 (2)	-	<0.1 (1)	<0.1 (2)	1.1 (4)	1.1 (7)
Stations						
Stoughton	-	4.5 (3)	2.9 (2)	-	<0.1 (1)	7.4 (6)
Easton	-	1.3 (2)	-	-	9.0 (3)	10.3 (5)
Raynham	-	11.9 (2)	-	-	-	11.9 (2)
Taunton	1.0 (1)	2.1 (2)	-	-	20.3 (6)	22.4 (8)
Freetown	-	-	-	-	4.2 (1)	4.2 (1)
New Bedford	-	-	-	-	-	-
Fall River	0.2 (1)	1.1 (6)	3.9 (9)	0.1 (1)	<0.1 (1)	5.1 (17)
Subtotal	1.2 (2)	20.9 (15)	6.8 (11)	0.1 (1)	33.5 (12)	61.3 (39)
Layover Facilities						
New Bedford	5.9 (1)	-		-	-	-
Fall River	-	-	18.4 (2)	-	-	18.4 (2)
Subtotal	4.9 (1)	-	18.4 (2)	-	-	18.4 (2)
TOTAL	**12.3 (18)**	**21.8 (25)**	**37.0 (26)**	**15.8 (35)**	**49.8 (42)**	**124.4(128)**

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

Table 4.2-15 Whittenton Electric Alternatives: Land Acquisition Summary by Municipality

Municipality	Public Ownership Area in acres (number of parcels)	Private Ownership Land Use Area in acres (number of parcels)				
		Commercial	Industrial	Residential	Undeveloped	Subtotal
Alignment						
Canton	-	0.1 (1)	-	-	-	0.1 (1)
Stoughton	0.7 (4)	0.4 (4)	-	0.7 (2)	2.4 (6)	3.5 (12)
Easton	0.2 (1)	-	-	-	-	-
Raynham	-	8.5 (3)	9.8 (3)	7.4 (10)	12.5 (9)	38.2 (25)
Taunton	-	-	4.2 (10)	-	0.1 (3)	4.3 (13)
Berkley	<0.1 (1)	-	0.3 (1)	5.5 (3)	0.8 (4)	6.6 (8)
Lakeville	-	-	-	-	0.2 (4)	0.2 (4)
Freetown	<0.1 (1)	-	-	0.1 (4)	<0.1 (1)	0.1 (5)
New Bedford	0.4 (1)	-	0.3 (5)	-	-	0.3 (5)
Fall River	0.9 (1)	-	-	<0.1 (2)	<0.1 (1)	<0.1 (3)
Subtotal	2.2 (9)	9.0 (8)	14.6 (19)	13.7 (21)	16.0 (28)	53.3 (76)
Traction Power Substations						
Canton	-	-	-	-	0.5 (1)	0.5 (1)
Easton	1.1 (1)	-	-	-	-	-
Taunton	-	-	<0.1 (1)	<0.1 (2)	-	<0.1 (3)
Berkley	<0.1 (1)	-	-	-	-	-
Freetown	-	-	-	-	0.2 (1)	0.2 (1)
New Bedford	-	-	-	-	0.2 (1)	0.2 (1)
Fall River	-	-	-	-	0.2 (1)	0.2 (1)
Subtotal	1.1 (2)	-	<0.1 (1)	<0.1 (2)	1.1 (4)	1.1 (7)
Stations						
Stoughton	-	4.5 (3)	2.9 (2)	-	<0.1 (1)	7.4 (6)
Easton	-	1.3 (2)	-	-	9.0 (3)	10.3 (5)
Raynham	-	11.9 (2)	-	-	-	11.9 (2)
Taunton	1.0 (1)	1.5 (1)	4.1 (9)	-	9.3 (5)	14.9 (15)
Freetown	-	-	-	-	4.2 (1)	4.2 (1)
New Bedford	-	-	-	-	-	-
Fall River	0.2 (1)	1.0 (6)	3.9 (9)	0.1 (1)	<0.1 (1)	5.0 (17)
Subtotal	1.1 (2)	20.2 (14)	10.9 (20)	0.1 (1)	22.5 (11)	53.7 (46)
Layover Facilities						
New Bedford	5.9 (1)	-	-	-	-	-
Fall River	-	-	18.4 (2)	-	-	18.4 (2)
Subtotal	5.9 (1)	-	18.4 (2)	-	-	18.4 (2)
TOTAL	**10.3 (14)**	**29.2 (22)**	**43.9 (42)**	**13.8 (25)**	**39.6 (43)**	**126.5 (131)**

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

4.3 SOCIOECONOMICS

4.3.1 Introduction

This chapter describes the social and economic environment within and adjacent to the South Coast Rail project corridor and analyzes the impacts to the social and economic environment resulting from implementing each of the South Coast Rail alternatives, including the No-Build Alternative. Background information on the proposed South Coast Rail project and a description of each of the proposed alternatives are provided in Chapter 3, *Alternatives*.

Section 4.3.2 describes the social and economic environment within and adjacent to the South Coast Rail project corridors. The section serves as the baseline for estimating the potential impacts resulting from the South Coast Rail alternatives. The effects to the social and economic environment that may result from implementation of the proposed South Coast Rail alternatives are presented in Sections 4.3.3 and 4.3.4; Section 4.3.3 presents the effect for each element of the proposed alternatives while Section 4.3.4 summarizes the effects for each alternative.

4.3.1.1 Resource Definition

Social and economic characteristics encompass population characteristics and trends as well as economic characteristics and trends. Social and economic characteristics include population, income, housing, property tax revenues, business activity, employment, and unemployment.

4.3.1.2 Regulatory Context

The CEQ NEPA regulations require that an Environmental Impact Statement evaluate a proposed action's impact on the human environment, including "urban quality, historic and cultural resources, and the design of the built environment," including the reuse and conservation potential of various alternatives and mitigation measures.[1] The Corps' public interest review includes economics as a public interest factor (33 CFR § 320.4(a)).

There are no state regulations applicable to the analysis of social and economic effects of a proposed project. The Secretary of the Executive Office of EEA[2] issued a Certificate on the ENF on April 3, 2009. The certificate includes a number of requirements defining the scope of a forthcoming Draft EIR. However, no specific requirements for the evaluation of impacts related to the social and economic environment are included in the Certificate.[3]

4.3.2 Existing Conditions

The following describes the existing conditions within the social and economic environment study area, including population, housing, employment, median income, current economic development tools, and work-trip characteristic trends.

[1] Council on Environmental Quality. 2009. Code of Federal Regulations (CFR), Title 40: Protection of the Environment, Part 1502-Environmental Impact Statement, Section 16(g) Environmental Consequences (40 CFR 1502.16(g)).

[2] Formerly, the Executive Office of Environmental Affairs.

[3] Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. South Coast Rail Project. April 3, 2009.

4.3.2.1 Methodology

Social and economic data were collected from the following sources: U.S. Census Bureau, SRPEDD, Metropolitan Area Planning Council (MAPC), Massachusetts Executive Office of Labor and Workforce Development, Central Transportation Planning Staff (CTPS), Claritas, Inc. and the South Coast Rail Economic Development and Land Use Corridor Plan.

All household income data is presented in 1999 dollars. The 1989 median household income data obtained from the 1990 Census of Housing and Population were adjusted for inflation to using the Northeast Urban Consumer Price Index (CPI) to allow for comparison between this data and the 1999 median household income data obtained from Census 2000.

The 2010 U.S. Census results were not available at the time the DEIS/DEIR was prepared. Select indicators from the 2010 Census have been incorporated in this chapter to ensure an up-to-date consideration of socioeconomic trends, while still relying on pre-2010 Census data for the majority of the detailed existing conditions evaluation. It was determined that a complete update of the socioeconomic profile of the study area was not necessary because such an update would not change the overall conclusions about socioeconomic conditions from those presented in the DEIS/DEIR. Although important events such as the 2008 economic recession have impacted the study area, the demographics of the area and the relative economic condition of the municipalities in the study area has not fundamentally changed.

4.3.2.2 Regional Overview

Table 4.3-1 identifies communities included in the regional study area for socioeconomics.[4] This includes 17 municipalities in Bristol County and 3 municipalities in Plymouth County. The alternative railroad alignments pass through or near these 20 communities, and new station sites are within or near each. Social and economic conditions within each of these municipalities, relative to the alternative alignments and station sites, are discussed further below.

Table 4.3-1 Social and Economic Environment Study Area Communities

Acushnet	Fall River	Rehoboth
Attleboro	Freetown	Rochester
Berkley	Lakeville	Somerset
Dartmouth	Mattapoisett	Swansea
Dighton	New Bedford	Taunton
Easton	Norton	Westport
Fairhaven	Raynham	

Southeastern Massachusetts is one of the fastest growing regions within the northeastern United States, and is the fastest growing region in the Commonwealth, based on population and housing units. As communities close to Boston approached build-out and residential and real estate prices increased over the last decade, both the population and the number of Boston-oriented commuters in the South Coast region have increased. In addition, the South Coast area has experienced considerable, but variable

[4] This discussion of South Coast regional communities reflects the DEIS/DEIR socioeconomics study and includes communities associated with alternatives no longer under consideration (i.e., the Attleboro and Rapid Bus Alternatives). Communities associated with alternatives that have been eliminated were retained in the regional study area only for purposes of consistency with the DEIS/DEIR existing conditions analysis and are not considered in the FEIS/FEIR impact analysis (which is focused on the Stoughton and Whittenton Alternatives).

commercial and industrial growth. The South Coast area is also one of the Commonwealth's more diverse regions, and includes older former mill cities, rural towns, and suburban bedroom communities.

Population and housing growth have not been equally distributed, with the historic cities of New Bedford and Fall River experiencing a decline in population for many years, nor has the regional development been matched by a growth in jobs. Known for its seacoast and estuaries, cranberry ponds, rural landscapes that contain globally rare species and environments, and cities with an important role in the nation's economic and cultural past, southeastern Massachusetts more recently has experienced struggling cities, congested highways, and sprawling development, resulting in a loss of green spaces.

Growth-related concerns within the South Coast region include:[5]

- The South Coast region had been growing faster than the Commonwealth as a whole, but this trend has changed and the region is now growing slightly slower than the Commonwealth. Between 1990 and 2006, the region experienced a 10.3 percent increase in population, exceeding the statewide increase of 6.9 percent. U.S. Census Bureau data indicate that the South Coast region population increased from 773,748 in 2000 to 796,306 in 2010, a net increase of 22,558 persons or 2.9 percent. Comparatively, the population of Massachusetts as a whole increased from 6,349,097 in 2000 to 6,547, 629 in 2010, an increase of 3.1 percent.[6]

- The region is part of a "sprawl frontier" of low-density development spreading out from Greater Boston. The communities with the most developable land have the least capacity to manage growth in terms of infrastructure, existing plans and policies, and municipal staff.

- Semi-rural communities located between I-495 and I-195 (including Rehoboth, Dighton, Berkley, and Rochester) are most vulnerable to unplanned growth because they lack infrastructure, land protection for key parcels, and often times town staff to help them plan.

- Fall River and New Bedford continued to lose population during the 1990s. Fall River's population continued to decline in the early 21st century, from 91,938 in 2000 to 88,857 in 2010, a loss of 3,081 persons at a rate of 3.4 percent over these 10 years. New Bedford's population increased in the early 21st century, from 93,768 in 2000 to 95,072 in 2010, a gain of 1,304 persons at a rate of 1.4 percent over these 10 years.[7]

- Residential development tends to first occur as low-density residential development on lots along rural road frontage.

- Although 18 percent of South Coast Rail communities' land is permanently protected, important habitat and resource areas are not yet effectively covered by protected land.

- Although job concentrations continue to be important in South Coast cities, low-density sprawl along major highways also increasingly characterizes business and job locations.

[5] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.

[6] USCB "2010 Census Interactive Population Search" website, available at http://www/census.gov/2010census/popmap/ipmtext.php?fl=25

[7] USCB "2010 Census Interactive Population Search" website, available at http://www/census.gov/2010census/popmap/ipmtext.php?fl=25

- While many communities have added zoning and other regulatory tools to promote more compact development patterns, in most cases these tools have been little used thus far—in some cases because of recent adoption but also because of market inertia and lack of local capacity to promote new approaches.

- Between 1976 and 2000, job growth in the South Coast region lagged behind Massachusetts, which in turn lagged behind the United States as a whole. Over half the manufacturing jobs in the corridor disappeared, with construction, retail, wholesale trade, and services replacing manufacturing.

- The competitive advantages of the South Coast region today are in costs of production: labor, land, energy, and to a lesser degree, taxes. Lower housing costs help reduce the cost of labor.

- The barriers to economic growth in communities in the vicinity of the South Coast Rail project are access to labor, labor skill levels, quality of broadband service, and access to any intermodal freight rail yard.

- Potential growth industries based on current strengths and overcoming barriers (especially workforce access, education, and broadband service) include: distribution, office-related industries, health care and social services, food processing, hospitality, chemical manufacturing, electronics, and construction.

- Indicators for Fall River and New Bedford show that those communities have significantly lower median household incomes, education levels, housing values and per capita local tax receipts than the South Coast region as a whole.

- The South Coast region has been characterized by ex-urban sprawl, the decline of gateway cities, and the consumption of natural areas at a rate that exceeds the population growth rate. This type of uncontrolled growth results in the loss of farms, fields, and forests and damages the character of the historic villages and cities within the region.

- The poor connectivity to the metropolitan Boston area may constrain economic activity in the urban areas of New Bedford and Fall River. These two cities currently have higher unemployment rates than the state average. In 2007, the New Bedford metropolitan area had an unemployment rate of 7.6 percent, while Fall River had an unemployment rate of 8.3 percent. The state average was 4.5 percent.[8] By 2010, unemployment had risen to 14.5 percent in Fall River and 14.0 percent in New Bedford, compared to 8.3 percent statewide.[9]

Affected Municipalities

The following section summarizes, by municipality, general social and economic conditions within the South Coast region. Table 4.3-2 summarizes the population statistics for these communities. Table 4.3-3 summarizes housing trends. Table 4.3-4 summarizes employment statistics. Table 4.3-5 provides a summary of work trips to Boston/Cambridge from these communities. Workforce traveling to

[8] Massachusetts Executive Office of Labor and Workforce Development website http://www.mass.gov/eolwd, accessed August 2008 and October 2010

[9] Massachusetts Executive Office of Labor and Workforce Development. Labor Force and Unemployment Data http://lmi2.detma.org/lmi/lmi_lur_a.asp

Boston/Cambridge from these communities as compared to the workforce along the Fitchburg Commuter Line is summarized in Table 4.3-6. Table 4.3-7 summarizes household income. Table 4.3-8 provides employment statistics by industry. Property tax rates are summarized in Table 4.3-9.

Acushnet

Acushnet is a mostly rural and suburban town. It had an estimated population of 10,622 in 2006, which represented a 4.5 percent increase since 2000. The number of occupied housing units in Acushnet increased 10.6 percent between 1990 and 2000, corresponding to a 6.4 percent increase in population during this period. The median household income increased from approximately $48,210 in 1989 (in 1999 dollars) to approximately $51,500 in 1999, which corresponds to an annual growth rate of 0.66 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Acushnet was 5.4 percent, exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 10.2 percent, exceeding statewide unemployment of 8.4 percent. Acushnet's unemployment rate also exceeded the statewide average in 1990 and 2000. In 2005, property tax rates in Acushnet were 12.71 (expressed as dollars per $1,000 of assessed value) for commercial and industrial property, and 10.9 for residential property.

Attleboro

Attleboro is a suburban community in the South Coast region. It had an estimated population of 43,836 in 2006. The number of occupied housing units in Attleboro increased 12.3 percent between 1990 and 2000, while population increased only 9.6 percent during this period. The median household income increased from approximately $49,421 in 1989 (in 1999 dollars) to approximately $50,807 in 1999, which corresponds to an annual growth rate of 0.28 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Attleboro was 4.9 percent, slightly higher than the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 10.8 percent, exceeding statewide unemployment of 8.4 percent. In 2005, property tax rates in Attleboro were $16.57/$1,000 assessed value for commercial and industrial property, and $10.09/$1,000 assessed value for residential property.

Berkley

Berkley is a mostly rural town, with suburban neighborhoods along its northern border. It had an estimated population of 6,476 in 2006, which represented a 12.7 percent increase since 2000. The number of occupied housing units in Berkley increased 36.3 percent between 1990 and 2000, corresponding to a 35.7 percent increase in population during this period. The median household income decreased from approximately $58,024 in 1989 (in 1999 dollars) to approximately $56,170 in 2000, which corresponds to an annual growth rate of -0.32 percent, which is well below the statewide annual growth rate of 0.13 percent. While the unemployment rate in Berkley in 1990 exceeded the statewide average, the 2007 unemployment rate was 4.0 percent, lower than the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 8.2 percent, slightly below the statewide rate of 9.4 percent. In 2005, the property tax rate in Berkley was $17.82/$1,000 assessed value (residential, commercial, and industrial).

Dartmouth

Dartmouth is a mostly rural town with a strip of suburban neighborhoods in its northern/central region. It had an estimated population of 31,466 in 2006, which represented a 2.6 percent increase since 2000.

The number of occupied housing units in Dartmouth increased 14.9 percent between 1990 and 2000, corresponding to a 12.6 percent increase in population during this period. The median household income increased from approximately $47,406 to approximately $50,742 between 1989 and 1999 (both in 1999 dollars), which corresponds to an annual growth rate of 0.68 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Dartmouth was 5.5 percent, exceeding the statewide unemployment rate of 4.5 percent. By 2009, unemployment had risen to 9.6 percent, exceeding statewide unemployment of 8.4 percent. In 2005, the property tax rate in Dartmouth was $7.45/$1,000 assessed value (residential, commercial, and industrial).

Dighton

Dighton is a mostly rural town. It had an estimated population of 6,652 in 2006, which represented a 7.7 percent increase since 2000. The number of occupied housing units in Dighton increased 14.2 percent between 1990 and 2000, corresponding to a 9.7 percent increase in population during this period. The median household income increased from approximately $55,068 to $58,600 between 1989 and 1999 (both in 1999 dollars), which corresponds to an annual growth rate of 0.62 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Dighton was 4.5 percent, which was also the statewide unemployment rate. By 2009, unemployment had risen to 8.8 percent, slightly above the statewide unemployment rate of 8.4 percent. In 2005, the property tax rates in Dighton were $20.8/$1,000 assessed value for commercial and industrial property, and $10.66/$1,000 assessed value for residential property.

Easton

Easton is a mostly suburban town. It had an estimated population of 23,099 in 2006, which represented a 3.6 percent increase since 2000. The number of occupied housing units in Easton increased 11.6 percent between 1990 and 2000, corresponding to a 12.6 percent increase in population during this period. The median household income increased from approximately $68,330 in 1989 (in 1999 dollars) to approximately $69,144 in 1999, which corresponds to an annual growth rate of 0.12 percent, which is about the same as the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Easton was 3.7 percent, lower than the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 7.4 percent but was still lower than the statewide average of 8.4 percent. In 1990 and 2000 Easton also exhibited a lower unemployment rate than the state as a whole. In 2005, the property tax rate in Easton was $7.45/$1,000 assessed value (residential, commercial and industrial).

Fairhaven

Fairhaven is a mostly suburban town, with urban development at its western border and rural neighborhoods in the northeast corner. It had an estimated population of 16,340 in 2006, which represented a 1.1 percent increase since 2000. The number of occupied housing units in Fairhaven increased 4.1 percent between 1990 and 2000, despite a decrease in population of 0.2 percent during this period. After adjusting for inflation, median household income decreased from approximately $40,605 in 1989 (in 1999 dollars) to approximately $36,447 in 1999, which corresponds to an annual growth rate of -1.07 percent, which is well below the statewide annual growth rate of 0.13 percent. In both years, median household income was significantly below the statewide median of $49,850 and $50,500 (both in 1999 dollars), respectively. The 2007 unemployment rate in Fairhaven was 5.6 percent, exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 10.4 percent, exceeding the statewide average of 8.4 percent. Fairhaven's unemployment rate also

exceeded the statewide average in 1990 and 2000. In 2005, the property tax rates in Fairhaven were $16.66/$1,000 assessed value for commercial and industrial property, and $8.35/$1,000 assessed value for residential property.

Fall River

The southern portion of Fall River is highly developed and urban, while the northern portion is rural. Fall River had an estimated population of 92,516 in 2006, which represented a 0.6 percent increase since 2000. With a population size similar to New Bedford, Fall River is one of the two largest municipalities in the South Coast region in terms of population, accounting for 18 percent of South Coast population. The number of occupied housing units in Fall River increased 4.0 percent between 1990 and 2000, despite a decrease in population of 0.8 percent during this period. The median household income decreased from approximately $30,291 in 1989 (in 1999 dollars) to approximately $29,014 in 1999, which corresponds to an annual growth rate of -0.43 percent, which is well below the statewide annual growth rate of 0.13 percent. In both years, median household income was significantly below the statewide median of $49,850 and $50,500 (both in 1999 dollars), respectively. The 2007 unemployment rate in Fall River was 8.3 percent, significantly exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 14.6 percent, exceeding the statewide average of 8.4 percent. Fall River's unemployment rate also significantly exceeded the statewide average in 1990 and 2000. In 2005, the property tax rates in Fall River were $19.5/$1,000 assessed value for commercial and industrial property, and $7.61/$1,000 assessed value for residential property.

Freetown

Freetown is mostly rural. It had an estimated population of 9,145 in 2006, which represented a 7.9 percent increase since 2000. The number of occupied housing units in Freetown increased 7.8 percent between 1990 and 2000, despite a decrease in population of 0.6 percent during this period. The median household income increased from approximately $61,382 in 1989 to approximately $64,576 in 1999, which corresponds to an annual growth rate of 0.51 percent, which exceeds the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Freetown was 4.7 percent, slightly exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had increased to 8.8 percent, slightly exceeding the statewide average of 8.4 percent. In 2005, the property tax rates in Freetown were $15.47/$1,000 assessed value for commercial and industrial property, and $9.88/$1,000 Assessed Value for residential property.

Lakeville

Lakeville is a mixed suburban and rural community. It had an estimated population of 10,699 in 2006, which represented an 8.9 percent increase since 2000. The number of occupied housing units in Lakeville increased 26.4 percent between 1990 and 2000, corresponding with an increase in population of 26.2 percent during this period. The median household income increased from approximately $60,524 in 1989 (in 1999 dollars) to approximately $70,495 in 1999, which corresponds to an annual growth rate of 0.51 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Lakeville was 4.2 percent, slightly lower than the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 8.7 percent, slightly exceeding the statewide average of 8.4 percent. In 2005, the property tax rate in Lakeville was $9.14/$1,000 assessed value (residential, commercial, and industrial).

Mattapoisett

Mattapoisett is a semi-rural community. It had an estimated population of 6,519 in 2006, which represented a 4.0 percent increase since 2000. The number of occupied housing units in Mattapoisett increased 13.4 percent between 1990 and 2000, corresponding with an increase in population of 7.1 percent during this period. The median household income increased from approximately $54,596 in 1989 (in 1999 dollars) to approximately $58,466 in 1999, which corresponds to an annual growth rate of 0.69 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Mattapoisett was 3.8 percent, lower than the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 7.1 percent but was still significantly below the statewide average of 8.4 percent. In 2005, the property tax rate in Mattapoisett was $9.42/$1,000 assessed value (residential, commercial, and industrial).

New Bedford

New Bedford is a highly developed urban city, with some semi-rural communities in its northwestern portion. It had an estimated population of 93,957 in 2006, which represented a 0.2 percent increase since 2000. With a population size similar to Fall River, New Bedford is the largest municipality in the South Coast region in terms of population, each account for 18 percent of South Coast population. The number of occupied housing units in New Bedford decreased 1.6 percent between 1990 and 2000, corresponding to a 6.2 percent decline in population during this period. The median household income decreased from approximately $30,554 in 1989 (in 1999 dollars) to approximately $27,569 in 1999, which corresponds to an annual growth of -1.02 percent, well below the statewide growth rate of 0.13 percent. In both years, median household income was significantly below the statewide median of $49,850 and $50,500 (both in 1999 dollars), respectively. The 2007 unemployment rate in New Bedford was 7.6 percent, significantly exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 14.2 percent, significantly exceeding the statewide average of 8.4 percent. New Bedford’s unemployment rate also significantly exceeded the statewide average in 1990 and 2000. In 2005, the property tax rates in New Bedford were $27.6/$1,000 assessed value for commercial and industrial property, and $11.37/$1,000 assessed value for residential property.

Norton

Norton is a mixed suburban and rural town. It had an estimated population of 19,637 in 2006, which represented an 8.9 percent change since 2000. The number of occupied housing units in Norton increased 26.5 percent between 1990 and 2000, corresponding to a 26.4 percent increase in population during this period. The median household income decreased from approximately $59,175 to approximately $55,325 between 1989 and 1999 (both in 1999 dollars), which corresponds to an annual growth of -0.67 percent, well below the statewide growth rate of 0.13 percent. The 2007 unemployment rate in Norton was 4.7 percent, similar to the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 8.9 percent, exceeding the statewide average of 8.4 percent. In 2005, the property tax rate in Norton was $10.72/$1,000 assessed value (residential, commercial, and industrial).

Raynham

Raynham is a mixed suburban and rural town. It had an estimated population of 13,805 in 2006, which represented a 17.6 percent change since 2000. The number of occupied housing units in Raynham increased 23.6 percent between 1990 and 2000, corresponding to a 19.0 percent increase in population

during this period. After adjusting for inflation, median household income remained stable from approximately $60,504 in 1989 (in 1999 dollars) to approximately $60,449 in 1999, which corresponds to an annual growth of -0.01 percent, which is less than the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Raynham was 4.1 percent, lower than the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 8.1 percent, slightly below the statewide average of 8.4 percent. In 2005, the property tax rates in Raynham were $13.42/$1,000 assessed value for commercial and industrial property, and $10.25/$1,000 assessed value for residential property.

Rehoboth

Rehoboth is a semi-rural town with an estimated population of 11,020 in 2006, which represented an 8.3 percent change since 2000. The number of occupied housing units in Rehoboth increased 22.8 percent between 1990 and 2000, corresponding to a 17.5 percent increase in population during this period. The median household income increased from approximately $60,667 in 1989 to approximately $65,373 in 1999, which corresponds to an annual growth rate of 0.75 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Rehoboth was 4.3 percent, similar to the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 9.6 percent, exceeding the statewide average of 8.4 percent. In 2005, the property tax rate in Rehoboth was $8.86/$1,000 assessed value (residential, commercial, and industrial).

Rochester

Rochester is a semi-rural town with an estimated population of 5,158 in 2006, which represented a 12.63 percent increase since 2000. The number of occupied housing units in Rochester increased 22.3 percent between 1990 and 2000, corresponding to a 16.8 percent increase in population during this period. The median household income increased from approximately $56,664 to approximately $63,289 between 1989 and 1999 (both in 1999 dollars), which corresponds to an annual growth rate of 0.75 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Rochester was 4.0 percent, lower than the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 7.7 percent, lower than the statewide average of 8.4 percent. In 2005, the property tax rate in Rochester was $9.21/$1,000 assessed value (residential, commercial, and industrial).

Somerset

Somerset is a mostly urban community. It had an estimated population of 18,747 in 2006, which represented a 2.8 percent change since 2000. The number of occupied housing units in Somerset increased 9.0 percent between 1990 and 2000, corresponding to a 3.3 percent increase in population during this period. The median household income increased from approximately $49,133 in 1989 (in 1999 dollars) to approximately $51,770 in 1999, which corresponds to an annual growth rate of 0.52 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Somerset was 5.5 percent, exceeding the statewide unemployment rate of 4.5 percent. Somerset's unemployment rate also exceeded the statewide average in 1990 and 2000. By 2009, the unemployment rate had risen to 10.6 percent, exceeding the statewide average of 8.4 percent. In 2005, the property tax rates in Somerset were $25.15/$1,000 assessed value for commercial and industrial property, and $10.73/$1,000 assessed value for residential property.

Swansea

Swansea is a mixed rural and suburban town. It had an estimated population of 16,622 in 2006, which represented a 4.5 percent change since 2000. The number of occupied housing units in Swansea increased 12.1 percent between 1990 and 2000, corresponding to a 3.2 percent increase in population during this period. The median household income decreased from approximately $54,124 in 1989 (in 1999 dollars) to approximately $52,524 in 1999, which corresponds to an annual growth rate of -0.30 percent, well below the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Swansea was 5.6 percent, exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 11.2 percent, exceeding the statewide average of 8.4 percent. Swansea's unemployment rate also exceeded the statewide average in 1990 and 2000. In 2005, the property tax rates in Swansea were $16.36/$1,000 assessed value for commercial and industrial property, and $8.09/$1,000 assessed value for residential property.

Taunton

Taunton is a mixed urban/suburban/rural city, with a highly developed urban center. It had an estimated population of 56,732 in 2006, which represented a 1.4 percent increase since 2000. About 11 percent of the South Coast population lives in Taunton. The number of occupied housing units in Taunton increased 17.0 percent between 1990 and 2000, corresponding to a 12.3 percent increase in population during this period. The median household income decreased from approximately $43,600 in 1989 (in 1999 dollars) to approximately $42,932 in 1999, which corresponds to an annual growth rate of -0.30 percent, well below the statewide annual growth rate of 0.13 percent. In both years, median household income was below the statewide median of $49,850 and $50,500 (both in 1999 dollars), respectively. The 2007 unemployment rate in Taunton was 5.0 percent, exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 9.8 percent, exceeding the statewide average of 8.4 percent. In 2005, the property tax rates in Taunton were $18.1/$1,000 assessed value for commercial and industrial property, and $8.64/$1,000 assessed value for residential property.

Westport

Westport is a primarily semi-rural town, with suburban development along its northern border. It had an estimated population of 15,366 in 2006, which represented an 8.3 percent increase since 2000. The number of occupied housing units in Westport increased 8.8 percent between 1990 and 2000, corresponding to a 2.4 percent increase in population during this period. The median household income increased from approximately $50,042 to approximately $55,436 between 1989 and 1999, which corresponds to an annual growth rate of 0.52 percent, exceeding the statewide annual growth rate of 0.13 percent. The 2007 unemployment rate in Westport was 6.1 percent, exceeding the statewide unemployment rate of 4.5 percent. By 2009, the unemployment rate had risen to 11.1 percent, exceeding the statewide average of 8.4 percent. Westport's unemployment rate also exceeded the statewide average in 1990 and 2000. In 2005, the property tax rate in Westport was $6.14/$1,000 assessed value (residential, commercial, and industrial).

Demographic Trends

In 1990, the total population of the social and economic environment study area was approximately 469,229. In 2000, the population within the study area was 492,366.[10] By 2006, population within this

[10] United States Census Bureau, 1990 and 2000.

area is estimated to have grown to 508,414.[11] Table 4.3-2 summarizes population trends for the communities within the social and economic environment study area. Figure 4.3-1 shows which municipalities experienced population growth between 1990 and 2006 and which experienced population decline during that same period. While Fall River and New Bedford did not experience population decline between 2000 and 2006, they lost population during the nineties.

Table 4.3-2 South Coast Communities: Population Trends

				Percent Change		
Town	**1990**	**2000**	**2006***	**1990 to 2000**	**2000 to 2006**	**1990 to 2006**
Acushnet	9,554	10,161	10,622	6.35	4.54	11.18
Attleboro	38,383	42,068	43,836	9.60	4.20	14.21
Berkley	4,237	5,749	6,476	35.69	12.65	52.84
Dartmouth	27,244	30,666	31,466	12.56	2.61	15.50
Dighton	5,631	6,175	6,652	9.66	7.72	18.13
Easton	19,807	22,299	23,099	12.58	3.59	16.62
Fairhaven	16,132	16,159	16,340	0.17	1.12	1.29
Fall River	92,703	91,938	92,516	-0.83	0.63	-0.20
Freetown	8,522	8,472	9,145	-0.59	7.94	7.31
Lakeville	7,785	9,821	10,699	26.15	8.94	37.43
Mattapoisett	5,850	6,268	6,519	7.15	4.00	11.44
New Bedford	99,922	93,768	93,957	-6.16	0.20	-5.97
Norton	14,265	18,036	19,637	26.44	8.88	37.66
Raynham	9,867	11,739	13,805	18.97	17.60	39.91
Rehoboth	8,656	10,172	11,020	17.51	8.34	27.31
Rochester	3,921	4,581	5,158	16.83	12.60	31.55
Somerset	17,655	18,234	18,747	3.28	2.81	6.19
Swansea	15,411	15,901	16,622	3.18	4.53	7.86
Taunton	49,832	55,976	56,732	12.33	1.35	13.85
Westport	13,852	14,183	15,366	2.39	8.34	10.93

Source: U.S. Census (1990, 2000); Claritas, Inc. provided by Goody Clancy (2006
* Indicates projected populations, not actual numbers.

U.S. Census Bureau data indicate that the South Coast region population increased from 773,748 in 2000 to 796,306 in 2010, a net increase of 22,558 persons or 2.9 percent. Comparatively, the population of Massachusetts as a whole increased from 6,349,097 in 2000 to 6,547, 629 in 2010, an increase of 3.1 percent, and the population of Rhode Island increased from 1,048,319 to 1,052,567, or 0.4 percent. The population increase in the South Coast region during this period was comparable to that of Massachusetts, but substantially greater than that of Rhode Island. The population density in 2000 for the study area, based on data from MassGIS and the U.S. Bureau of Census, is shown on Figure 4.3-2.

Concurrent with population growth within the study area, the median age is increasing in these communities at a rate of approximately 9 percent (between 1990 and 2000)[12] and is expected to

[11] 2006 Population estimated using Claritas, Inc., provided by Goody Clancy. It is assumed that populations estimated with Claritas are not exact, but rather +/- 10 percent.

[12] Southeastern Regional Planning and Economic Development District's Community Quickstats, based on U.S. Census Bureau data from 1990 and 2000, compiled summer 2007.

continue to increase in coming years. Growth is anticipated to be greatest in semi-rural and suburban portions of the social and economic environment study area where there is less development; therefore, more land is available for growth than in the more urban communities.[13]

Housing

The increase in population within the study area has been accompanied by an increase in the number of occupied housing units. According to the U.S. Bureau of Census, the number of housing units increased by 8.7 percent in the nineties, from 174,408 in 1990 to 189,634 in 2000. As the region continues to grow and more people move into the area, the number of occupied housing units is projected to increase at an even larger rate. It is estimated that by the year 2030, occupied housing units will have increased by almost 34 percent to reach 208,767. The communities of Berkley, Rehoboth, and Rochester are projected to grow by more than 50 percent. Nine of the 20 communities are expected to see growth in excess of 30 percent. Table 4.3-3 summarizes the occupied housing unit trends and percent change from 1990 to 2000 for the 20 communities comprising the South Coast Rail social and economic environment study area.

Table 4.3-3 South Coast Communities: Occupied Housing Units

Town	1990	2000	Percent Change 1990 to 2000
Acushnet	3,428	3,793	10.6
Attleboro	14,180	16,019	13.0
Berkley	1,352	1,843	36.3
Dartmouth	9,190	10,555	14.9
Dighton	1,927	2,201	14.2
Easton	6,708	7,489	11.6
Fairhaven	6,359	6,622	4.1
Fall River	37,303	38,759	3.9
Freetown	2,722	2,932	7.7
Lakeville	2,604	3,292	26.4
Mattapoisett	2,233	2,532	13.4
New Bedford	38,788	38,178	1.6
Norton	4,641	5,872	26.5
Raynham	3,352	4,143	23.6
Rehoboth	2,870	3,523	22.8
Rochester	1,288	1,575	22.3
Somerset	6,410	6,987	9.0
Swansea	5,252	5,888	12.1
Taunton	18,849	22,045	17.0
Westport	4,952	5,386	8.8
TOTAL	**174,408**	**189,634**	**8.7**

Source: U.S. Census (1990, 2000)

In general, residential housing density within the study area is low. Housing density within the study area, based on U.S. Census Bureau 2000 data, is depicted on Figure 4.3-3.[14] Fall River, New Bedford, and

[13] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.

[14] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.

Taunton have the highest housing densities in the study area, while Lakeville, Berkley, Rehoboth, Westport, and Dartmouth are among those with the lowest housing densities. In general, the social and economic environment study area consists primarily of lower-density development characteristic of semi-rural communities. The lot size requirement in many of the communities is large (up to 2 acres) and there are limited multi-family housing units, both factors contributing to lower housing densities.

Economic Indicators

This section presents trends in business establishments, employment, and wages for the study area. These trends cover 1990 to 2007 and were developed primarily from data prepared by the U.S. Census Bureau (1990 and 2000 Census data) and SRPEDD Community Quickstats for communities comprising the South Coast region.

Employment

The population and housing statistics indicate that the region has seen significant growth over the last fifteen years. Employment concentrations (2007) within the study area are presented on Figure 4.3-4. In 2007, businesses were concentrated around cities and large towns as well as along major highways and state routes.[15] As observed by Goody Clancy, "Businesses line nearly the entire stretch of U.S. 44 through the middle of the [South Coast Rail] Corridor; although as shown by the lighter shades [on Figure 4.3-4] densities are low, which indicates sprawling commercial development."[16] This same pattern can be observed along Routes 79 and 24, north of Fall River, a portion of Route 140, north of New Bedford, as well as in the immediate vicinity of exits along I-95 and I-495.

The region's growth has been accompanied by high unemployment rates. Table 4.3-4 shows historical unemployment rates for the communities in the social and economic environment study area, as well as the statewide unemployment rate. The table compares the unemployment rates for 1990, 2000 2007 and 2009 in the study area municipalities to the statewide unemployment rates in the same years.

The table indicates that in 1990 and 2000, the number of cities and towns in the region with unemployment higher than the state average was 16 and 12, respectively. In general, the inequality between the regional and statewide unemployment decreased between 1990 and 2007, but in 2007, 12 communities still had average unemployment rates higher than the state average. By 2009, a total of 15 communities had average unemployment rates higher than the state average. Unemployment rates in Fall River and New Bedford are substantially higher than the statewide average. By 2010, unemployment had risen to 14.5 percent in Fall River and 14.0 percent in New Bedford, compared to 8.3 percent statewide.[17]

Table 4.3-4 shows a decline in the discrepancy between local unemployment and statewide unemployment between 1990 and 2007 for all study area municipalities with the exception of Swansea and Westport. The increased number of South coast residents commuting to the Boston metropolitan area could provide a partial explanation for this decline. Table 4.3-5 shows that work trips from South Coast communities to Boston and Cambridge increased by nearly 39 percent between 1990 and 2000. The change in work trips to Boston and Cambridge from communities within the social and economic

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[15] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.

[16] Ibid.

[17] Massachusetts Executive Office of Labor and Workforce Development. http://lmi2.detma.org/lmi/lmi_lur_a.asp. Accessed on July 8, 2013.

environment study area is shown graphically on Figure 4.3-5. Comparing 1990 to 2009 shows that six communities experienced an increase in the discrepancy between their unemployment and statewide unemployment, including Lakeville and Rehoboth, which in 1990 had unemployment rates below the statewide average.

Table 4.3-4 South Coast Communities: Unemployment Rates

	1990		2000		2007		2009	
	Rate	Compared to State	Rate	Compared to State	Rate	Compared to State	Rate	Compared to State
Statewide	6.3	100%	2.7	100%	4.5	100%	8.4	100%
Acushnet	**8.1**	**129%**	**3.4**	**126%**	**5.4**	**120%**	**10.2**	**121%**
Attleboro	**7.7**	**122%**	**3.3**	**122%**	**4.9**	**109%**	**10.8**	**129%**
Berkley	**7.3**	**116%**	2.3	85%	4	89%	8.2	98%
Dartmouth	**8.2**	**130%**	**3.5**	**130%**	**5.5**	**122%**	**9.6**	**114%**
Dighton	**7**	**111%**	2.7	100%	4.5	100%	**8.8**	**105%**
Easton	5.9	94%	2.3	85%	3.7	82%	7.4	88%
Fairhaven	**8.1**	**129%**	**3.6**	**133%**	**5.6**	**124%**	**10.4**	**124%**
Fall River	**12.8**	**203%**	**5.1**	**189%**	**8.3**	**184%**	**14.6**	**174%**
Freetown	**7.2**	**114%**	**3**	**111%**	**4.7**	**104%**	**8.8**	**105%**
Lakeville	5	79%	2.4	89%	4.2	93%	**8.7**	**104%**
Mattapoisett	5.5	87%	2.6	96%	3.8	84%	7.1	85%
New Bedford	**12.5**	**198%**	**5.5**	**204%**	**7.6**	**169%**	**14.2**	**169%**
Norton	**7.1**	**113%**	2.5	93%	**4.7**	**104%**	**8.9**	**106%**
Raynham	**6.8**	**108%**	2.2	81%	4.1	91%	8.1	96%
Rehoboth	6.1	97%	**3.3**	**122%**	4.3	96%	**9.6**	**114%**
Rochester	**6.4**	**102%**	2.5	93%	4	89%	7.7	92%
Somerset	**7.8**	**124%**	**3.5**	**130%**	**5.5**	**122%**	**10.6**	**126%**
Swansea	**7.2**	**114%**	**3.8**	**141%**	**5.6**	**124%**	**11.2**	**133%**
Taunton	**8.3**	**132%**	**2.9**	**107%**	**5**	**111%**	**9.8**	**117%**
Westport	**8.2**	**130%**	**4**	**148%**	**6.1**	**136%**	**11.1**	**132%**

Source: Massachusetts Executive Office of Labor and Workforce Development website, viewed August 2008 (viewed February 2009 for Attleboro) (these data were not seasonally adjusted).
Bold indicates above state average.

The growth in work trips to the metropolitan Boston job market, as well as the projected increase in population and housing, reflect the movement of affordable housing units further from the urban core job market. Because of the growing congestion on Route 24, it is likely that a substantial portion of commuters destined for the Boston job market would be interested in using the proposed transit service.

Each of the communities evaluated reported an increase in the number of work-related commuters traveling to Boston and Cambridge between 1990 and 2000. Six of the communities reported growth of greater than 100 percent. Lakeville reported the most growth with over 250 percent more workers commuting to Boston and Cambridge in 2000 than in 1990. This increase may, in part, be attributed to the Middleborough/Lakeville commuter rail station, which opened in 1997. Acushnet and New Bedford had the smallest increase, at less than 10 percent between 1990 and 2000.

Table 4.3-5 South Coast Communities: Work Trips to Boston/Cambridge Trends

Town of Residence	1990	2000	Percent Change 1990-2000
Acushnet	119	126	5.9
Attleboro	996	1,451	45.7
Berkley	74	122	64.9
Dartmouth	142	363	155.6
Dighton	98	117	19.4
Easton	1,320	1,495	13.3
Fairhaven	103	155	50.5
Fall River	428	714	66.8
Freetown	88	188	113.6
Lakeville	103	383	271.8
Mattapoisett	78	101	29.5
New Bedford	723	741	2.5
Norton	754	840	11.4
Raynham	295	438	48.5
Rehoboth	81	161	98.8
Rochester	96	205	113.5
Somerset	122	200	63.9
Swansea	73	191	161.6
Taunton	1,069	1,301	21.7
Westport	90	222	146.7
TOTAL	**6,852**	**9,514**	**38.8**

Source: Central Transportation Planning Staff; U.S. Census Bureau, Journey to Work Data (1990, 2000)

Table 4.3-6 provides a place of employment comparison between towns in the social and economic environment study area and those along the Fitchburg Line, which is comparable in terms of distance from Boston. The table shows that in 2000, approximately four percent of all work trips originating from within the social and economic environment study area were to the Boston/Cambridge area, while along the Fitchburg Line corridor 8.5 percent of work trips were to Boston or Cambridge.

Table 4.3-6 Work Trips to Boston/Cambridge: Comparative Analysis

South Coast Area				Fitchburg Line			
Town of Residence	Boston/ Cambridge Workers	Total Workers	% Working in Boston/ Cambridge	Town of Residence	Boston/ Cambridge Workers	Total Workers	% Working in Boston/ Cambridge
Acushnet	126	5,204	2.4	Acton	1,693	8,524	19.9
Attleboro	1,451	21,540	6.7	Ayer	221	3,861	5.7
Berkley	122	3,106	3.9	Boxborough	296	2,710	10.9
Dartmouth	363	14,100	2.6	Concord	1,466	7,374	19.9
Dighton	117	3,255	3.6	Fitchburg	274	17,129	1.6
Easton	1,495	12,226	12.2	Harvard	324	2,752	11.8
Fairhaven	155	7,812	2.0	Lancaster	56	3,087	1.8
Fall River	714	38,840	1.8	Leominster	587	19,854	3.0
Freetown	188	4,800	3.9	Littleton	405	4,240	9.6
Lakeville	383	5,109	7.5	Lunenburg	128	4,953	2.6
Mattapoisett	101	3,135	3.2	Maynard	576	5,837	9.9
New Bedford	741	37,537	2.0	Shirley	174	2,791	6.2
Norton	840	8,932	9.4	Stow	341	3,112	11.0
Raynham	438	6,236	7.0	Sudbury	1,678	7,939	21.1
Rehoboth	161	5,575	2.9	Westminster	97	3,493	2.8
Rochester	205	2,455	8.4				
Somerset	200	8,921	2.2				
Swansea	191	8,213	2.3				
Taunton	1,301	27,870	4.7				
Westport	222	7,153	3.1				
TOTAL	**9,514**	**233,019**	**4.1**	**TOTAL**	**8,316**	**97,656**	**8.5**

Source: U.S. Census Data, Journey to Work (2000)

Median Household Income

Eight communities within the social and economic environment study area reported median household incomes below the statewide average in 1990; however, by 2000 only four municipalities were below the statewide average. Fairhaven, Fall River, New Bedford, and Taunton each reported median household incomes well below the statewide average in both 1989 and 1999 (Table 4.3-7). Even though the number of communities with median household incomes below the statewide average decreased, a total of eight South Coast communities experienced a decline (after adjusting for inflation) in median household income between 1989 and 1999 while statewide median household income showed annual modest increase (i.e., an annual growth rate of 0.14 percent). With negative annual growth rate of more than one percent (-1.07 percent in Fall River, and -1.02 percent in New Bedford), the gap between these communities and the statewide average is broadening substantially.

Table 4.3-7 South Coast Communities: Median Household Income

Town	1989*	1999	Annual Growth 1989-1999
Statewide	**$49,854**	**$50,502**	**0.13**
Acushnet	**$48,210**	$51,500	0.66
Attleboro	**$49,421**	$50,807	0.28
Berkley	$58,024	$56,174	**-0.32**
Dartmouth	**$47,406**	$50,742	0.68
Dighton	$55,068	$58,600	0.62
Easton	$68,330	$69,144	**0.12**
Fairhaven	**$40,605**	**$36,447**	**-1.07**
Fall River	**$30,291**	**$29,014**	**-0.43**
Freetown	$61,382	$64,576	0.51
Lakeville	$60,524	$70,495	1.54
Mattapoisett	$54,596	$58,466	0.69
New Bedford	**$30,554**	**$27,569**	**-1.02**
Norton	$59,175	$55,325	**-0.67**
Raynham	$60,504	$60,449	**-0.01**
Rehoboth	$60,667	$65,373	0.75
Rochester	$56,664	$63,289	1.11
Somerset	**$49,133**	$51,770	0.52
Swansea	$54,124	$52,524	**-0.30**
Taunton	**$43,598**	**$42,932**	**-0.15**
Westport	$50,042	$55,436	1.03
Regional Average Income**	$42,147	$42,736	0.14%

Source: 1990 Census of Housing and Population, Census 2000
* In 1999 dollars, adjusted for inflation using the Northeast Urban CPI.; **Bold** indicates below state average
** Regional Average Income was calculated as the weighted average of the median household incomes in the study area municipalities.

After adjusting for inflation, the regional average household income exhibited an annual increase of 0.14 percent between 1989 and 1999, similar to the statewide increase. The regional average household income was calculated as the average of the median household incomes of the study area municipalities, weighted by the number of households in each municipality.

Household income in the South Coast region increased from an average of $53,532 in 2000 to $77,237 in 2010, a rise of 36.5 percent. Comparatively, average household income in Massachusetts increased from $50,502 in 2000 to $65,981 in 2010, a rise of 30.7 percent.[18]

Industry Trends

The working population within the South Coast region is employed in a variety of industries, as summarized in Table 4.3-8. Industries consistent among all (or nearly all) communities include

[18] USCB "American Fact Finder, Community Facts" website, available at http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

construction; manufacturing; wholesale trade; retail trade; professional and technical services; art, entertainment, and recreation; and accommodation and food service.

The majority of workers in the South Coast region are employed in blue collar and service jobs such as construction, manufacturing, retail trade, health care/social assistance, and accommodation and food service. A large portion of the population is also employed in educational service jobs, particularly towns with higher median incomes, such as Rochester, Lakeville, and Rehoboth. Workers in the larger South Coast cities, such as Fall River and New Bedford are concentrated in the manufacturing and health care/social assistance sector.

Per Capita Local Tax Receipts and Property Tax Rates

Communities within the social and economic environment study area generally exhibit lower land and housing values, with some of these communities also having relatively low levels of per capita property tax receipts, as compared to the Commonwealth as a whole.[19] An evaluation of per capita property tax receipts and property value may be used as a means of assessing a community's economic prosperity, and particularly its ability to finance local government services. In general, the South Coast region ranks well below the statewide average of local tax receipts per capita owing to the relatively low levels of property tax receipts within several communities. Of the South Coast municipalities within the study area, Fall River and New Bedford rank low on both measures, compared to other communities within the South Coast region. Fall River, New Bedford, and Taunton have a greater balance between residential and commercial property tax receipts compared to the South Coast region as a whole, even as their receipts per capita for commercial property are well below the statewide average.[20]

Lower property tax receipts per capita do not necessarily reflect lower tax rates, and therefore are not a measure of potential competitive advantage for attracting new households or businesses. Property tax rates within the study area vary greatly and are summarized in Table 4.3-9. New Bedford, Somerset, Dighton, Fall River, and Taunton have the highest property and commercial/industrial tax rates within the study area. However, residential tax rates within these communities vary, ranging from 7.61 in Fall River, the third lowest residential rate, to 11.37 in New Bedford, the highest residential tax rate in the region. After New Bedford, the highest residential tax rates are in Acushnet, Attleboro, Somerset, Norton, Easton, and Dighton. Tax rates are expressed as dollars per $1,000 of assessed value.

[19] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.
[20] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan Appendix E. June 2009. Prepared by Goody Clancy: Boston.

Table 4.3-8 South Coast Communities: Percent Employment by Industry, 2006

Industry	Agriculture, Forestry, Fishing, Hunting and Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation and Warehousing	Finance and Insurance	Real Estate/ Rental/ Leasing	Professional and Technical Service*	Management of Companies and Enterprises	Administrative and Waste Service	Educational Services	Health Care/ Social Assist.	Arts, Entertainment and Recreation	Accommodation and Food Service	Other Services	Public Administration	Unclassified	Total Workers
Town																			
Acushnet	0.0	18.9	9.9	2.1	5.7	N/A	1.5	1.0	1.4	N/A	0.8	N/A	7.9	0.0	14.2	4.7	0.0	31.9	1,490
Attleboro	0.0	4.6	29.3	3.0	11.5	0.9	1.2	0.7	2.8	0.0	3.4	0.0	18.4	0.8	10.6	3.9	2.3	6.5	18,639
Berkley	0.0	14.8	6.5	0.8	13.2	N/A	N/A	N/A	4.4	N/A	7.6	N/A	N/A	N/A	N/A	3.4	N/A	49.3	643
Dartmouth	0.1	4.6	7.2	1.9	27.3	N/A	1.6	0.9	2.0	0.3	2.6	12.5	14.9	2.1	12.8	3.6	N/A	4.2	15,618
Dighton	N/A	7.3	13.9	28.6	2.8	2.0	1.6	N/A	2.3	N/A	0.8	17.8	7.6	1.1	2.2	1.5	N/A	9.3	1,845
Easton**	N/A	8.0	6.9	4.0	9.8	2.7	2.3	0.5	4.4	N/A	6.1	0.3	4.8	0.9	5.9	5.1	N/A	N/A	12,627
Fairhaven	2.8	5.4	12.2	1.8	19.8	0.5	2.8	0.2	2.4	2.8	2.3	4.7	15.6	1.4	14.3	4.8	N/A	6.2	6,404
Fall River	N/A	3.5	19.8	4.9	9.2	1.1	3.9	1.0	3.9	1.3	2.9	0.4	26.3	0.6	6.2	4.2	10.9	N/A	36,989
Freetown	0.9	9.4	10.4	2.8	4.3	N/A	0.7	0.1	1.6	N/A	11.8	N/A	1.0	0.1	5.8	2.1	N/A	49.0	3,757
Lakeville	N/A	7.2	6.0	7.3	4.7	N/A	3.2	0.9	6.8	N/A	4.7	14.2	9.5	3.7	3.6	3.3	N/A	24.9	3,170
Mattapoisett	N/A	6.7	6.8	11.7	9.1	0.9	1.7	6.3	6.6	N/A	2.1	19.1	2.9	2.0	11.7	8.0	N/A	4.3	1,828
New Bedford	2.8	3.5	21.4	4.8	7.6	2.7	2.6	1.0	4.4	N/A	3.1	7.3	20.6	0.9	6.1	5.2	N/A	6.0	37,223
Norton	N/A	4.4	9.0	20.3	7.3	1.4	1.6	0.6	2.6	N/A	5.5	16.6	11.3	2.8	6.7	3.1	N/A	6.8	6,017
Raynham	N/A	4.2	14.6	3.9	28.9	3.1	3.6	0.8	2.8	1.6	7.4	2.8	4.9	3.6	13.4	2.6	N/A	2.0	8,788
Rehoboth	1.5	16.4	5.1	4.6	8.3	2.1	1.6	0.6	2.1	N/A	7.2	10.9	11.4	6.2	9.8	5.7	N/A	6.5	1,854
Rochester	9.7	12.9	0.4	6.5	3.9	N/A	2.3	2.4	2.4	N/A	11.8	33.7	N/A	1.2	2.4	2.4	N/A	7.6	735
Somerset	0.2	3.3	10.2	0.3	21.2	N/A	3.0	0.9	8.9	N/A	1.8	0.2	13.8	1.0	14.8	4.5	N/A	15.3	4,451
Swansea	0.4	5.4	2.6	2.8	27.4	1.0	5.9	1.3	2.2	N/A	2.3	7.5	15.1	1.6	13.8	3.9	N/A	3.9	5,876
Taunton	N/A	5.5	9.3	7.1	17.1	5.7	2.2	0.6	12.1	0.9	3.3	6.1	14.5	0.5	7.0	3.3	4.0	N/A	25,653
Westport	4.0	24.1	3.5	5.3	11.2	1.9	1.9	0.9	4.1	N/A	5.9	N/A	2.9	2.0	12.0	5.5	N/A	14.5	3,378

Source: SRPEDD Community Quickstats, Summer 2007.
N/A Not Applicable, Industry not identified as an available category for the city or town.
* Professional and Technical Services include those in the utilities and information sectors.
** Employment data for Easton does not account for all workers within the municipality. Approximately 4,836, or 38.3 percent, of the workforce is unreported but is anticipated to be spread out among the various industries in similar proportions to reporting workers.

Table 4.3-9 South Coast Communities: Property Tax Rates[1], 2005[2]

	Personal Property Tax[2]	Residential Tax	Commercial and Industrial Tax
Acushnet	12.71	10.9	12.71
Attleboro[3]	16.57	10.09	16.57
Berkley	7.82	7.82	7.82
Dartmouth	7.45	7.45	7.45
Dighton	20.8	10.66	20.8
Easton	10.69	10.69	10.69
Fairhaven	16.66	8.35	16.66
Fall River	19.5	7.61	19.5
Freetown	15.47	9.88	15.47
Lakeville	9.14	9.14	9.14
Mattapoisett	9.42	9.42	9.42
New Bedford	27.6	11.37	27.6
Norton	10.72	10.72	10.72
Raynham	13.42	10.25	13.42
Rehoboth	8.86	8.86	8.86
Rochester	9.21	9.21	9.21
Somerset	25.04	10.73	25.15
Swansea	16.36	8.09	16.36
Taunton	18.1	8.64	18.1
Westport	6.14	6.14	6.14

1 Tax rates are expressed as dollars per $1,000 assessed value.
2 Property Tax Rate data, MassStats http://massstats.detma.org/websaras/frame_it.asp?theProductName=MassStats
3 Attleboro data obtained from www.mass.gov, Massachusetts Department of Revenue tax information.

Economic Development Tools

With unemployment on the rise, economic development tools are important to maintaining stability within the social and economic environment study area communities. Where not already in place, approaches have been established, or are planned for several of the communities within the study area. Such tools often are developed within local offices such as redevelopment authorities and economic/industrial development commissions. The municipalities of Attleboro, Fall River, New Bedford, and Taunton have redevelopment authorities. Economic or industrial development commissions are operating in Dartmouth, Dighton, Freetown, New Bedford, Norton, Raynham, Rehoboth, Somerset, Swansea, and Taunton.

Tax Increment Financing (TIF) and District Improvement Financing (DIF) are methods used to promote economic development and redevelopment in communities using public/private partnerships.[21] TIF programs provide tax exemptions of up to 100 percent of the tax increment to individual landowners and developers for projects that have been deemed to be within Economic Opportunity Areas.[22,23] The

[21] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.
[22] Ibid.
[23] Economic Opportunity Areas are determined by the Massachusetts Economic Assistance Coordinating Council (EACC).

implementation of a DIF allows a city or town to designate development districts that use the increased tax revenues derived from new development to fund district-wide improvements, such as streetscape or storefront projects.[24]

Based on information from the Massachusetts Economic Assistance Coordinating Council (EACC), TIF programs apply to projects associated with Economic Opportunity Areas. Such programs provide individuals (landowners and developers) with tax exemptions of as much as 100 percent of the tax increment.[25]

TIFs can be used to maintain existing businesses as well as to create or encourage new businesses. DIF programs differ from TIFs in that they allow cities/towns "to designate development districts that use the increased tax revenues derived from new development (the increment), to specifically fund district-wide improvements, often in the form of streetscape and storefront projects."[26]

Seventeen of the 20 communities within the study area offer TIF programs. Easton, Rehoboth, and Swansea do not currently offer such a program. New Bedford has offered TIF programs since 1997.[27] Currently 77 businesses within the city use TIF, which has resulted in 2,750 jobs for New Bedford. Additionally, a DIF has been utilized in New Bedford to facilitate the revitalization of a 130-acre area (Hicks-Logan Sawyer area) near downtown New Bedford, off I-195.[28] More suburban towns, such as Dartmouth and Attleboro, have also benefited from the use of TIFs, which have facilitated new jobs and new construction within each of these towns.

Summary

As a whole, the communities within the study area have a growing population and growing demand for housing, although Fall River and New Bedford, the two largest cities in the study area in terms of population have seen the least growth over the past 20 years. The analysis shows that the region's population is projected to increase by approximately 30 percent by 2030. However, the region also has higher unemployment rates than the state average, indicating that residents lack access to employment markets. Real median household incomes increased in more than half of the South Coast communities and the number of communities with a median household income below the statewide household income decreased from eight to four. Work trips to Boston have increased by 38 percent over the period 1990-2000, but are still only approximately four percent of all work trips. This is substantially lower than the percentage of work trips to Boston of other communities with rail access, such as the Fitchburg Line at 8 percent.

4.3.3 Analysis of Impacts

This section presents the social or economic effects from implementing each of the South Coast Rail project alternatives during the construction phase and upon completion of the project. The potential long-term social and economic effects considered include loss of property tax revenue for municipalities from the acquired privately owned parcels, employment displacement, residential displacement, and fragmentation of neighborhoods or loss of continuity between neighborhoods. The indirect and

[24] Massachusetts Executive Office of Transportation and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.
[25] Ibid.
[26] Ibid.
[27] Ibid.
[28] Ibid.

cumulative socioeconomic effects associated with the South Coast Rail Alternatives are addressed in Chapter 5.

The impact analysis includes: (1) the potential impacts along alternative alignments; (2) the potential impacts at the station locations and; (3) the potential impacts at layover facilities. The land acquisition required for the alignments, stations and layover facilities for each element of the alternatives are presented in Chapter 4.2, *Land Use*. A summary of impacts by alternative is presented in Section 4.3.4.

4.3.3.1 Methodology

Construction Impacts Methodology

The construction associated with the alternatives would support temporary jobs in the South Coast region in construction and related industries during the estimated four-year construction period. Construction job estimates are based on the Corridor Plan,[29] which presents total economic impacts for four study areas: (1) Taunton and communities south; (2) Northern communities; (3) Boston and Cambridge; and (4) the rest of Massachusetts.

The economic impact assessment does not include potential negative effects related to temporary displacement of businesses and their operations or lost economic opportunities during construction activities.

Permanent Impacts Methodology

The potential long-term social and economic effects of the South Coast Rail alternatives include loss of property tax revenue for municipalities from the acquired privately owned parcels, displacement of existing businesses, residential displacement, fragmentation of neighborhoods or loss of continuity between neighborhoods and job creation related to the operation of the new service.

The land acquisition required for the alignments, stations and layover facilities for each element of the alternatives are presented in Chapter 4.2, *Land Use*, which identifies parcel ownership and land usage for each parcel. The right-of-way acquisitions would generally be small portions of numerous undeveloped parcels. Property tax revenue losses associated with the right-of-way acquisitions of small portions of undeveloped parcels were not estimated and it was assumed that there would not be any job displacement or residential displacement associated with these small acquisitions. Exceptions are discussed in the relevant sections.

For privately-owned parcels that would be wholly acquired for the layover facilities or train stations, or where more than 50 percent of the parcel would be acquired, it is assumed that a proportional value of property tax revenue would be lost. Estimates of annual property tax revenue loss (in 2013 dollars) from parcels were made based upon each municipality's property tax formula. Estimates of the loss of property tax revenues for local municipalities, property tax revenue data were obtained based on a review of online resources of the affected municipalities. A screening analysis was performed to identify which parcels have a potential for job displacement based on the presence of privately-owned industrial or commercial buildings. It was assumed that all jobs at risk for displacement would be lost. Residential displacement was estimated by multiplying the number of units that would potentially displaced by the average household size in the affected municipality.

[29] Massachusetts Executive Office of Transportation and Public Works and Massachusetts Office of Housing and Economic Development. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009. Prepared by Goody Clancy: Boston.

Where less than 50 percent of a parcel would be acquired for the layover facilities or train stations, it was assumed that the scale and precision of the preliminary engineering plans limit the accuracy of the acquisition projections. Changes in property tax revenue loss resulting from any remaining minimal acquisitions will be determined in final design of the selected alternative.

The potential social effects of the railroad alignments include neighborhood fragmentation or loss of continuity between neighborhoods. This potential impact was evaluated by reviewing locations where constructing new railroad corridors or reconstructing unused railroads are proposed, in particular focusing on where these alignments pass through residential areas. A qualitative rating of fragmentation effects was made on a relative basis for each alignment, ranging from none to moderate, depending upon the number of road crossings, degree of neighborhood maturity, and housing density along the alignments. Neighborhood fragmentation is not considered a likely effect of improving and using existing, active railroad alignments. It is also not a likely effect of reconstructing or constructing and using non-linear facilities such as stations or layover facilities. More information on the social effects is presented in Chapter 4.5, *Visual and Aesthetic Resources*, where changes in the visual environment that would adversely affect communities are identified.

All Build Alternatives would require employees for train operations, rail or highway maintenance, station and layover facility operations, and administration. Some of these roles may be assigned to existing MBTA staff; others would require new hires or contracts with private firms. The number of new jobs that would be created for these tasks was not estimated.

Property Value Impact Analysis Methodology

Residential property values near stations and alignments may be affected. A literature review[30] of the effects of commuter rail service on property values concluded that residential property values in areas with access to commuter rail increased anywhere from 5 to 25 percent, with most increases between 6 and 10 percent. The literature review findings are presented in more detail below. Presumably, greater increases would be realized closer to the stations, with less of an effect with increasing distance from the station. This indirect effect is considered for the train stations, as these facilities would be access points to the transit system. Each station site was reviewed for nearby properties (within a 0.5-mile radius) zoned for residential use to qualitatively determine if residential property values would be likely to increase. No changes in residential real estate values are expected near existing stations. The potential increases in residential property values are not quantified. A screening analysis indicates the possibility of an increase in residential property values near each station with a “yes” or “no.”

As described in Chapter 4.4, *Environmental Justice*, some station sites are within or near low-income neighborhoods. Increases in property values in these neighborhoods could make homes and businesses too expensive to afford. However, TOD may offset this effect if development plans require affordable housing.

Similarly, residential real estate values in proximity to railroad alignments may decrease in value. Based on an analysis of noise-sensitive receptors (i.e., residents) along the alignments, residential properties that would be affected by construction activities or train operations would likely experience a decrease in real estate value. Residential properties that would be moderately or severely impacted by noise are identified in Chapter 4.6, *Noise*. As with the residential value increases near station sites, residential

[30] Reservitz, David. 2009. Impacts of Commuter Rail Service on Residential Property Values. Reservitz Law Offices: Boston.

value decreases along railroad alignments presumably would be greatest close to the alignments with less of an effect with increasing distance from the railroad.

In summary, residential property values near stations may increase as a result of the improved access to transit, with further increases possible in areas where transit-oriented development (TOD) is possible. Conversely, residential property values along the alternative alignments may decrease as a result of increased noise from train operations. Property value increases may have an adverse impact on certain populations (low income), if homes and businesses become too expensive to afford. This effect may be offset if TOD includes an affordable housing component.

Property Value Impact Literature Review Summary

Reservitz (2009)[31] reviewed several studies on commuter rail impacts to property values, and found that commuter rail access near residential property values has a positive impact anywhere from 5 to 25 percent with most studies concluding that values would increase by 6 to 10 percent.

Armstrong (1994)[32] found that "there is an increase in single-family residential property values of approximately 6.7 percent by virtue of being located within a community having a commuter rail station."

Chen et al. (1997)[33] found that the positive effect on real estate values near station sites (due to increased access to transit services) was partially offset by a negative effect along the rail lines (due to increased nuisance impacts, principally noise and vibration). Chen et al did not quantify either the positive or negative changes in real estate values, but concluded that the "positive effect dominates the negative effect, which implies a declining price gradient as one moves away from [light rail transit] stations for several hundred meters." Armstrong (1994) found that there could be as much as a 20 percent decrease in residential property value for residences within 400 feet of MBTA's Fitchburg line.

4.3.3.2 No Build (Enhanced Bus) Alternative

The No Build Alternative (Enhanced Bus) would improve transit service to Boston from New Bedford, Fall River, and Taunton and would not include any capital improvements. Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts.

No new construction or land acquisition would be required for the No Build Alternative. There would be no impacts to property tax revenues or jobs. This alternative would not directly affect the social and economic environment.

4.3.3.3 Southern Triangle (Common to all Rail Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to the Stoughton and Whittenton Alternatives. The Southern Triangle would require 7.3 acres of private land acquisition for the diesel alternatives and 8.6 acres for the electric alternatives. Twenty-five privately-owned parcels would be acquired in full or part to support the right-of-way under all Rail Alternatives.

[31] Reservitz, D. Impacts of Commuter Rail Service on Residential Property Values. Reservitz Law Offices: Brockton MA.

[32] Armstrong, R.J. Jr. 1994. Impacts of Commuter Rail Service as Reflected in Single-Family Residential Property Values. In Transportation Research Record No. 1466, pp 88-98. Transportation Research Board of the National Academies.

[33] Chen, H., A. Rufolo, and K.J. Dueker. 1997. Measuring the Impact of Light Rail Systems on Single Family Home Values: A Hedonic Approach with GIS Application. Discussion Paper 97-3. Center for Urban Studies, College of Urban and Public Affairs, Portland State University: Portland OR.

An additional three parcels totaling 1.3 acres would be necessary to support traction power facilities under the electric alternatives. The number, area, public or private ownership, and general land use of parcels that would be acquired in each municipality along the Fall River Secondary and New Bedford Mainline right-of-ways, and for the traction power facilities for the electric alternatives, are summarized in Table 4.2-2 and shown in Figures 4.2-1a-d and 4.2-2a-c in Chapter 4.2, *Land Use*.

Thirteen undeveloped parcels totaling approximately 2.3 acres would be affected to support the Southern Triangle right-of-way or traction power facility sites. No business or community facility displacements would result from acquisition necessary to support the Rail Alternatives in the Southern Triangle. Six industrial parcels totaling 0.6 acre would be affected to support the right-of-way; no industrial parcels would be acquired for traction power facilities.

Three residential displacements would occur on two parcels at Myricks Junction in Berkley (Figure 4.2-2a). Based on the average Berkley household size of 3.1 persons, nine persons would be displaced by these acquisitions. Full acquisition of the two residential parcels in Berkley would result in the estimated property tax loss of approximately of $4,724.88 ($2009). Six partial acquisitions on residential parcels in Fall River and Freetown, and one additional partial acquisition in Berkley would be necessary to support the Southern Triangle right-of-way. Because of the size and anticipated impact on these parcels, property tax revenue loss has not been calculated for these parcels.

Improving and using the existing, active Fall River Secondary and New Bedford Main Line for the South Coast Rail project would not result in neighborhood fragmentation.

4.3.3.4 Stoughton Electric Alternative

The Stoughton Electric Alternative north of the Southern Triangle would be comprised of a portion of the Northeast Corridor and the entire Stoughton Line. This evaluation focuses on the existing and extended Stoughton Line segment; no construction would be required in the Northeast Corridor segment for this alternative, and the Southern Triangle segments were addressed in Section 4.3.3.3.

Along the Stoughton Line segment, the Stoughton Electric Alternative would require a total of 44.7 acres (87 parcels) of privately owned land: 43.6 acres (80 parcels) for the right-of-way, plus an additional 1.1 acres (seven parcels) for traction power facilities. The number, area, public or private ownership, and general land use of parcels that would be acquired in each municipality along the Stoughton Line right-of-way and for the traction power facilities for the Stoughton Electric Alternative, are summarized in Table 4.2-3 and shown in Figures 4.2-3a-e in Chapter 4.2, *Land Use*.

Most of the land that would be acquired for the Stoughton Line right-of-way or traction power facilities consists of small portions of either publicly or privately owned parcels. Many of the affected parcels are undeveloped parcels; other land uses include industrial, commercial and residential. Eight of the privately owned parcels that would be acquired for the Stoughton Line right-of-way would be acquired in full.

Property tax revenue losses for acquisitions of small portions of undeveloped parcels were not estimated. Two parcels in Raynham, near Raynham Junction and along the proposed right-of-way, would be acquired in full. Property tax losses from acquiring these two parcels would be $7,030, in 2013 dollars.

Residential displacement would occur in Raynham, from one home occupying one parcel south of Raynham Junction (Figure 4.2-3d). Based on the average Raynham household size of 2.8 persons, three persons would be displaced by this acquisition. No business or community facility displacements would result from these acquisitions along the Stoughton Line.

Improving and using the existing, active Stoughton Line for the South Coast Rail project would minimally fragment neighborhoods. The active portion of the Stoughton Line terminates at the Stoughton Station; the railroad south of this point ceased operations in the late 1950s. Track has been removed from much of the railroad bed between the Stoughton Station and Weir Junction. Informal and unauthorized residential and recreational use of the railroad bed in several communities has established neighborhood continuity where none may have existed during the active phase of the railroad.

In Stoughton, the alignment parallels Washington Street south of the Stoughton Station, adjacent to or passing through medium density commercial, industrial, and residential areas. The alignment does not bisect any residential areas in this segment and thus no neighborhood fragmentation would result from reconstruction and use of the Stoughton Line.

Entering Easton, the alignment passes through the densely developed downtown area, adjacent to or passing through commercial, industrial, and residential areas. An existing pedestrian-only crossing, at Williams Street near downtown Easton, will be closed, disrupting continuity in this community. In this same area, the adjacent neighborhoods were constructed near the active railroad line but have since encroached into the railroad right-of-way. Yards have been expanded into the right-of-way, and pedestrians have used the right-of-way as an informal path. Re-establishing rail service in this segment may fragment neighborhood relationships that have become informally established during the inactive railroad phase.

South of Easton village, the Stoughton Line corridor passes through low- to moderate-density residential development. Neighborhoods along this segment appear to lack cross-railroad continuity; it is unlikely that reconstructing and using the Stoughton Line in this segment would fragment any neighborhood. Near the southern Easton town boundary (approaching the Hockomock Swamp), the Stoughton Line passes between the Easton Country Club and the Pine Oaks Golf Course, in a narrow corridor separating these two private recreational facilities. The Stoughton Line would not fragment these independent, but similar, entities. Immediately prior to entering the Hockomock Swamp, the Stoughton Line passes the Southeastern Regional Vocational Tech School. Sports fields here have encroached into the Stoughton Line right-of-way, and would need to be relocated. This facility relocation would disrupt sports field use but not fragment the neighborhood.

In Raynham and Taunton, the Stoughton Line again is adjacent to or passes through commercial, industrial, and residential development. The alignment crosses most residential neighborhoods perpendicular to main thoroughfares. Although temporary delays in traffic patterns may occur at road/railroad crossings, it is unlikely that the presence of the railroad in this segment would fragment the neighborhoods or disrupt continuity. An exception would be the Route 138 (Broadway) crossing in Raynham. This crossing would be constructed as grade-separated, avoiding traffic delays during operations.

4.3.3.5 Stoughton Diesel Alternative

The Stoughton Diesel Alternative is identical to the Stoughton Electric Alternative with the exception of the locomotive power source. Diesel-powered train service differs from electric-powered service in not

requiring electrical infrastructure, and thus requiring a smaller footprint. The footprint of the impacted area would be smaller because traction power facilities would not be necessary. Right-of-way parcel acquisitions required for the Stoughton Line portion of the Stoughton Diesel Alternative are presented in Table 4.2-3 and shown in Figures 4.2-3a-e. This segment would require 43.6 acres (80 parcels) of privately owned land.

As with the Stoughton Electric Alternative, no business or community facility displacements would result from these acquisitions along the Stoughton Line. Residential displacement would occur in Raynham, from one home occupying one parcel south of Raynham Junction (Figure 4.2-3d). Based on the average Raynham household size of 2.8 persons, three persons would be displaced by this acquisition. Two parcels in Taunton located south of and adjacent to Thrasher Street, each occupied by a residence, would be acquired in full, resulting in residential displacement.

As discussed above for the Stoughton Electric Alternative, the Stoughton Diesel Alternative may fragment neighborhood relationships that have become informally established during the inactive railroad phase near Easton. Sports fields near the Hockomock Swamp have encroached into the Stoughton Line right-of-way, and would need to be relocated.

4.3.3.6 Whittenton Electric Alternative

The Whittenton Electric Alternative would result in many of the same impacts along the Stoughton Line as the Stoughton Alternatives, except that the southernmost portion of the Stoughton Line (from Raynham Junction to Weir Junction) would not be used. Therefore, residential displacements south of Raynham Junction under the Stoughton Alternatives would be avoided.

Land acquisition requirements along the portion of the Attleboro Secondary of the Whittenton Alternative, as noted in the DEIS/DEIR, have been eliminated (other than those related to the Dana Street Station described separately in Section 4.3.3.8).

For the right-of-way and traction power facilities, the Whittenton Electric Alternative would require 54.4 acres (83 parcels) of privately owned land from the combination of the Whittenton Branch, and the northern portion of the Stoughton Line: 53.3 acres (76 parcels) for the right-of-way and 1.1 acres (7 parcels) for the traction power facilities. Although the former Whittenton Branch segment of the Whittenton Alternative is owned by the Commonwealth, minor acquisitions would be required along the right-of-way to accommodate ancillary structures. The number, area, public or private ownership, and general land use of parcels that would be acquired for the Whittenton Electric Alternative are summarized by municipality in Table 4.2-4 and shown in Figures 4.2-4a-b.

Most of the land that would be acquired for this segment is small portions of undeveloped parcels. Property tax revenue losses for acquisitions of small portions of land were not estimated (i.e., less than 50 percent).

No residential, business, or community facility displacements would result from these small acquisitions.

The Whittenton Branch passes through a range of agricultural, industrial, commercial, and residential areas between Raynham Junction and Whittenton Junction. In Raynham and Taunton, the Whittenton Branch is adjacent to or passes through commercial, industrial, and residential development. The alignment crosses most residential neighborhoods perpendicular to main thoroughfares, or parallels the outer boundary of the neighborhoods. Although temporary delays in traffic patterns may occur at

road/railroad crossings, it is unlikely that the presence of the railroad in this segment would fragment the neighborhoods or disrupt continuity. Access to an aggregate facility adjacent to the Whittenton Branch would be relocated permanently. Current use of the right-of-way as an informal path would cease.

4.3.3.7 Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. Diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure, and thus requires a smaller footprint. In the Southern Triangle and along the Stoughton Line (north of Raynham Junction only), the land acquisition impacts of the Whittenton Diesel Alternative would be the same as described for the Stoughton Diesel Alternative. Along the Whittenton Branch, impacts of the Whittenton Diesel Alternative are anticipated to be a similar negligible amount as with the Whittenton Electric Alternative.

As with the Whittenton Electric Alternative, most of the land that would be acquired for this segment consists of small portions of undeveloped parcels. Property tax revenue losses for small acquisitions were not estimated (i.e., less than 50 percent). No residential, business, or community facility displacements would result from these small acquisitions. Neighborhood fragmentation impacts are also the same as for the Whittenton Electric Alternative.

4.3.3.8 Stations

This section provides basic descriptions of each station and a list of the parcels to be acquired, in whole or in part, to construct or reconstruct these stations for the South Coast Rail project. For the privately owned parcels that would be wholly acquired for the train stations, or where more than 50 percent of the parcel would be acquired, it is assumed that a proportional value of property tax revenue would be lost. Estimates of annual (in 2013 dollars) property tax revenue loss from parcels were made based upon each municipality’s property tax formula. A screening analysis was performed to identify which parcels have a potential for job displacement based on the presence of privately-owned industrial or commercial buildings. It was assumed that all jobs at risk for displacement would be lost. Residential displacement was estimated by multiplying the number of units that would potentially displaced by the average household size in the affected municipality. This evaluation does not consider neighborhood fragmentation, as the stations would not be linear facilities dividing communities.

Southern Triangle (Common to all Rail Alternatives)

The Southern Triangle would include six stations which are all common to all Build Alternatives.

Fall River Depot Station

The Fall River Depot Station would be a new station constructed along the Fall River Secondary to serve all Build Alternatives. It would be located near the intersection of North Davol Street and Pearce Street in Fall River.

The Fall River Depot Station site is a previously developed parcel including and surrounded by commercial and industrial development. Parcels that would be acquired and converted to transportation/utilities land use to construct the Fall River Depot Station are listed in Table 4.3-10 and shown in Figure 4.2-28.

The Fall River Depot Station would require 5.11 acres of land, comprised of 4.94 acres (16 parcels) of privately owned land and 0.17 acre (one parcel) of publicly owned land. Business displacements would result from these acquisitions. Commercial or industrial buildings on five of the parcels listed above would be acquired to construct this station. Businesses present include a flooring store, electrical company, tire service shop, and automobile detail service. Job losses from businesses occupying these buildings would be expected. Land acquisition for the Fall River Depot Station would not displace any community facilities, but would result in residential displacement (Parcel 0-22-0006). Based on the Fall River average household size of 2.3 persons, approximately 2 residents would be displaced.

All privately owned parcels would be acquired in whole or in excess of 50 percent;[34] property tax revenue losses for the City of Fall River are estimated at $70,777 per year, in 2013 dollars. Parcel number O-15-0020 is owned by the City of Fall River; no property tax revenue loss would result from acquiring this parcel.

Table 4.3-10 Fall River Depot Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
O-15-0001	Private	Industrial	Industrial	$7,836	Yes	0.80	100
O-15-0002	Private	Industrial	Industrial	$8,151	No	0.32	100
O-15-0008	Private	Industrial	Industrial	$11,830	Yes	0.19	100
O-15-0009	Private	Commercial	Industrial	NA[1]	Yes	0.07	100
O-15-0010	Private	Industrial	Commercial	NA[1]	Yes	0.12	100
O-15-0018	Private	Industrial	Industrial	$7,434	No	1.52	100
O-15-0020	Public	Industrial	Industrial	NA	No	0.17	100
O-15-0031	Private	Industrial	Undeveloped	$338	No	0.03	100
O-15-0032	Private	Industrial	Industrial	$3,200	No	0.35	100
O-15-0034	Private	Industrial	Industrial	$410	No	0.04	100
O-22-0005	Private	Commercial	Commercial	$5,803	Yes	0.12	100
O-22-0006	Private	Residential	Residential	$7,248	No	0.10	100
O-22-0007	Private	Residential	Commercial	$9,336	Yes	0.12	100
O-22-0008	Private	Commercial	Commercial	$1,625	Yes	0.53	100
O-22-0011	Private	Commercial	Industrial	$4,516	Yes	0.47	100
O-22-0016	Private	Commercial	Commercial	$3,050	No	0.12	100
O-22-0017	Private	Commercial	Commercial	NA[2]	Yes	0.04	100
TOTAL				**$70,777**		**5.11**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
1 Parcels O-15-0009 and O-15-0010 are included with Parcel O-15-0008 in Fall River assessor records.
2 Parcel O-22-0017 is included with Parcel O-22-0005 in Fall River assessor records.

Freetown Station

The Freetown Station would be a new station constructed along the Fall River Secondary to serve all Build Alternatives. It would be located along South Main Street in Freetown.

[34] Whenever more than 50 percent of a parcel is acquired, it is assumed that the entire parcel is acquired, resulting in a 100% loss of tax revenue

The Freetown Station site is an undeveloped parcel surrounded by low density residential development and undeveloped land. The parcel that would be acquired and converted to transportation/utilities land use to construct the Freetown Station is listed in Table 4.3-11 below and shown in Figure 4.2-29.

The Freetown Station would require acquisition of 4.18 acres (one parcel) of privately-owned land. No residential, business, or community facility displacements would result from this acquisition for the Freetown Station.

Less than 50 percent of parcel number 233-19 would be acquired for the Freetown Station and, accordingly, property tax revenue losses were not determined.

Table 4.3-11 Freetown Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
233-19	Private	Commercial	Undeveloped	TBD	No	4.18	15

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.

King's Highway Station

The King's Highway Station would be a new station constructed along the New Bedford Main Line to serve all Build Alternatives. It would be located near the intersection of King's Highway and Tarkiln Hill Road in New Bedford.

The King's Highway Station site is a previously developed parcel surrounded by industrial development. This station would share a parking lot with adjacent businesses; no land acquisition would be required (Figure 4.2-30). There would be no direct effects to land uses or the social and economic environment at this location.

Whale's Tooth Station

The Whale's Tooth Station would be a new station constructed along the New Bedford Main Line to serve all Build Alternatives. It would be located near the intersection of Acushnet Avenue and Hillman Street, near the southern terminus of the New Bedford Main Line.

The Whale's Tooth Station site is a previously developed parcel surrounded by industrial development. The City of New Bedford recently constructed a parking lot at this site in anticipation of the proposed South Coast Rail project. Development of this station would not require land acquisition. There would be no direct effects to land uses or the social and economic environment at this location.

Battleship Cove Station

The Battleship Cove Station would be a new station constructed along the Fall River Secondary that would serve all Build Alternatives. It would be located on Water Street in Fall River, near the southern terminus of the Fall River Secondary.

The Battleship Cove Station site is a previously developed parcel that is within the Ponta Delgada Plaza.

Construction of this station would not require land acquisition; would not result in any business, residential or community facility displacements; and would not result in direct impacts to land use or the social or economic and economic environment.

Taunton Depot Station

The Taunton Depot Station would be a new train station constructed along the New Bedford Main Line that would serve all rail alternatives. It would be located at 872 County Street in Taunton, behind the existing Target plaza.

The Taunton Depot Station site is an undeveloped parcel adjacent to commercial development and undeveloped lands. Parcels that would be acquired and converted to transportation/utilities land use to construct the Taunton Depot Station are listed in Table 4.3-12 below and shown in Figure 4.2-35.

Table 4.3-12 Taunton Depot Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
107-47	Private	Residential	Commercial	$106	No	0.56	100.0
107-48	Private	Industrial	Undeveloped	TBD	No	10.97	40
TOTAL				**$106**		**11.53**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.

The Taunton Depot Station would require 11.53 acres (two parcels) of privately-owned land. No residential, business, or community facility displacements would result from these acquisitions for the Taunton Depot Station.

Parcel number 107-47 would be wholly acquired and more than 50 percent of parcel number 107-48 would be acquired; property tax revenue losses for the Town of Taunton are estimated at $106 per year, in 2013 dollars. Less than 50 percent of parcel number 107-57 would be acquired for the Taunton Depot Station and, accordingly, property tax revenue losses were not determined. Additional property tax revenue losses could result from this acquisition.

Stoughton and Whittenton Alternatives

The same stations would be reconstructed or newly constructed under the Stoughton and Whittenton Alternatives, with the exception of one. More specifically, in addition to the stations common to all Build Alternatives, reconstruction of one existing station along the Stoughton Line (Canton Center) and construction of four new train stations (Stoughton, Easton Village, North Easton and Raynham Park) would occur under the Stoughton Alternatives and the Whittenton Alternatives. The Taunton Station would only be constructed under the Stoughton Alternatives while the Dana Street Station would be built only under the Whittenton Alternatives.

Canton Center Station

The Canton Center Station is an existing train station along the Stoughton Line that would be reconstructed and would serve all Build Alternatives. It is located at 710 Washington Street in Canton. No land acquisition would be required for reconstructing the Canton Center Station (Figure 4.2-25). There would be no direct effects to land uses or the social and economic environment at this location.

Canton Junction Station

The Canton Junction Station is an existing train station at the junction of the Stoughton Line with the Northeast Corridor; it would serve all Build Alternatives. It is located at the intersection of Beaumont and Sherman Streets in Canton. No construction or land acquisition would be required at the Canton Junction Station (Figure 4.2-26). There would be no direct effects to land uses or the social and economic environment at this location.

Easton Village Station

The Easton Village Station would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. The Easton Village Station site is on Sullivan Avenue at the transition point to Mechanic Street (near the intersection with Pond Street) in Easton.

The Easton Village Station site is an undeveloped parcel surrounded by industrial and residential development. The land is currently used as a parking lot. Parcels that would be acquired and converted to transportation/utilities land use to construct the Easton Village Station are listed in Table 4.3-13 and shown in Figure 4.2-27.

Table 4.3-13 Easton Village Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
16U-129	Private	Industrial	Commercial	TBD	No	0.11	13.5
16U-129C	Private	Industrial	Commercial	TBD	No	0.12	1.4
TOTAL				**TBD**		**0.23**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.

The Easton Village Station would require 0.23 acre (two parcels) of privately-owned land. No residential, business, or community facility displacements would result from these acquisitions for the Easton Village Station. Less than 50 percent of parcel numbers 16U-129 and 16U-129C would be acquired for the Easton Village Station and, accordingly, property tax revenue losses were not determined.

North Easton Station

The North Easton Station would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. It would be located at 21 Washington Street in Stoughton, behind the Roche Brothers Plaza.

The North Easton Station site is an undeveloped parcel surrounded by commercial development. Parcels that would be acquired and converted to transportation/utilities land use to construct the North Easton Station are listed in Table 4.3-14 and shown in Figure 4.2-45.

The North Easton Station would require 10.24 acres (five parcels) of privately-owned land. No residential, business, or community facility displacements would result from these acquisitions for the North Easton Station.

More than 50 percent of parcel number 060-006 would be acquired; property tax revenue losses for the Town of Easton are estimated at $6,893 per year, in 2013 dollars. Less than 50 percent of parcel

numbers 1U-1, 1U-48, 060-008 and 060-009 would be acquired. Property tax revenue losses were not estimated for these minor acquisitions.

Table 4.3-14 North Easton Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
1U-1	Private	Residential	Undeveloped	TBD	No	1.65	8
1U-48	Private	Commercial	Undeveloped	TBD	No	1.00	27
060-006	Private	Commercial	Undeveloped	$6,893	No	6.31	100
060-008	Private	Commercial	Commercial	TBD	No	0.59	15
060-009	Private	Commercial	Commercial	TBD	No	0.69	20
TOTAL				**$6,893**		**10.24**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.

Raynham Park Station

The Raynham Park Station would be a new train station constructed along the Stoughton Line that would serve the Stoughton or Whittenton Alternatives. It would be located at 1958 Broadway in Raynham, at the former Raynham Park Greyhound Track, currently the Raynham Park Simulcast Center.

The Raynham Park Station site is a developed parcel surrounded by recreational development and undeveloped land. Parcels that would be acquired and converted to transportation/utilities land use to construct this station are listed in Table 4.3-15 below and shown in Figure 4.2-32.

Table 4.3-15 Raynham Park Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
1-15	Private		Commercial	TBD	No	3.09	34
1-19-1	Private		Commercial	$7,030	Yes	8.81	59
TOTAL				**$7,030**		**11.90**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.

The Raynham Park Station would require 11.90 acres (two parcels) of privately owned land. Commercial buildings on parcel number 1-19-1 would be acquired to construct this station. The business present on this parcel is the Raynham Park Simulcast Center (an off-track betting facility). A proposal for developing a slots parlor casino on the Simulcast Center property exists at the time of the preparation of the FEIS/FEIR, but the outcome of this proposal is uncertain as there is a competitive process to determine the location of the new casino.[35] This assessment assumes that the land acquisition would result in the displacement of one business and job loss. No residential or community facility displacements would result from these acquisitions.

[35] http://www.bostonglobe.com/metro/2013/06/11/raynham-park-strikes-deal-with-town-over-slot-machine-parlor/1QLjMn7wbBFwoq505pvoeL/story.html.

More than 50 percent of parcel number 1-19-1 would be acquired; property tax revenue losses for the Town of Raynham are estimated at $7,030 per year, in 2013 dollars. Less than 50 percent of parcel number 1-15 would be acquired and, accordingly, property tax revenue losses were not determined.

Stoughton Station

The Stoughton Station would be a new train station along the Stoughton Line that would serve all Build Alternatives. In order to accommodate a second track, the existing Stoughton Station would be shifted from its location between Porter and Wyman Streets to a new location south of the Wyman Street at-grade crossing. Land uses and zoning designations of the parcel that would be acquired and converted to transportation/utilities land use to reconstruct the Stoughton Station are listed in Table 4.3-16 below and shown in Figure 4.2-33.

Table 4.3-16 Stoughton Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
053-101	Private	Industrial	Industrial	$7,923	Yes	1.05	100
053-102	Private	Industrial	Commercial	$8,782	Yes	4.42	100
054-110	Private	Commercial	Commercial	TBD	No	0.04	2
054-401	Private	Commercial	Commercial	TBD	No	0.01	10
054-406	Private	Industrial	Industrial	$4,436	Yes	1.90	100
054-407	Private	Industrial	Undeveloped	$1,352	No	0.02	100
TOTAL				**$22,493**		**7.44**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various)
TBD To be determined.

The relocated Stoughton Station would require acquisition of 7.44 acres (six parcels) of privately owned land. Four parcels would be obtained in entirety; 10 percent or less of two other parcels would be acquired. The estimated annual property tax revenue losses for the Town of Stoughton would be $24,493.

Although no residential or community facility displacements would result from these acquisitions, business displacements would occur and job losses may result. Parcels 053-101 and 053-102 are owned by individuals associated with the Alpha Chemical Company that has a manufacturing facility on Morton Street adjacent to the northern boundary of the station site. Available data indicate that these two parcels are used as warehouses and office (conference) space. Parcel 054-406 is owned by the Murphy Coal Company, a business with offices nearby on Washington Street. Available data indicate that the parcel contains a fuel storage and materials handling yard, parking lot, and vehicle repair garage.

The proposed relocation of the Stoughton Station would open up 2.5 acres of land for potential redevelopment. MBTA owns this property and it would be released for sale and redevelopment. This land, currently occupied by tracks and parking areas, is on the east side of the proposed tracks.

Taunton Station (Stoughton Alternatives)

The Taunton Station would be a new train station constructed along the Stoughton Line that would serve the Stoughton Alternatives only. It would be located near the intersection of East Arlington Street and William Hooke Lane in Taunton.

The Taunton Station site is a previously developed parcel surrounded by commercial development. Parcels that would be acquired and converted to transportation/utilities land use to construct the Taunton Station are listed in Table 4.3-17 below and shown in Figure 4.2-34.

Table 4.3-17 Taunton Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
55-759	Private	Residential	Commercial	$2,059	No	1.53	100
55-760	Private	Industrial	Undeveloped	$6,422	No	7.44	100
55-761	Private	Industrial	Undeveloped	$2,107	No	0.51	100
55-762	Private	Industrial	Undeveloped	$749	No	0.50	100
55-763	Private	Industrial	Undeveloped	$2,242	No	0.25	100
55-764	Private	Industrial	Undeveloped	$1,407	No	0.64	100
Pub ROW	Public	Transportation	Transportation	NA	No	0.95	100
TOTAL				**$14,986**		**11.82**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
NA Not applicable.

The Taunton Station would require 11.82 acres of land, comprised of 10.87 acres (six parcels) of privately owned land and 0.95 acre (one parcel) of publicly owned land. No residential, business, or community facility displacements would result from these acquisitions for Taunton Station.

More than 50 percent of all of the privately owned parcels would be acquired; property tax revenue losses for the Town of Taunton are estimated at $14,986 per year, in 2013 dollars. The public parcel is owned by the Town of Taunton; no property tax revenue loss would result from this acquisition.

Dana Street Station (Whittenton Alternatives)

The Dana Street Station would be a new station constructed along the Attleboro Secondary that would serve the Whittenton Alternatives only. It would be located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton. This area is densely developed with land uses including commercial, industrial, and residential properties.

The Dana Street Station site in Taunton is currently a vacant lot. The parcels that would be acquired and converted to transportation/utilities land use to construct this station are listed in Table 4.3-18 and shown in Figure 4.2-40.

The Dana Street Station in would require acquisition of 4.09 acres encompassing nine parcels of privately owned land. These parcels are vacant or appear to have an industrial use, but most are zoned as residential properties. More than 50 percent of parcel numbers 54-558, 54-449, 54-450, 54-451, 54-452, 54-453, 54-454 and 54-455 would be acquired; property tax revenue losses for the Town of Taunton are estimated at $6,112 per year, in 2013 dollars. Less than 50 percent of parcel number 54-171 would be acquired; property tax revenue losses were not determined. No residential, business, or community facility displacements would result from this acquisition for the Dana Street Station.

Table 4.3-18 Dana Street Station: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
54-171	Private	Industrial	Industrial	TBD	No	0.56	49
54-448	Private	Residential	Industrial	$1,183	No	0.44	100
54-449	Private	Residential	Industrial	$1,190	No	0.45	100
54-450	Private	Residential	Industrial	$1,203	No	0.47	100
54-451	Private	Residential	Industrial	$1,210	No	0.48	100
54-452	Private	Residential	Industrial	$1,223	No	0.50	100
54-453	Private	Residential	Industrial	$37	No	0.49	100
54-454	Private	Residential	Industrial	$33	No	0.35	100
54-455	Private	Residential	Industrial	$33	No	0.35	100
TOTAL				**$6,112**		**4.09**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
TBD To be determined.

Summary of Effects Associated with Stations

Constructing some of the stations would require removing commercial or industrial buildings, potentially resulting in a loss of jobs. Table 4.3-20 lists the communities where South Coast Rail stations would be sited, the workforce in each community, and whether or not job losses are expected from station construction.

Job loss and business displacement would be limited to Fall River, Raynham and Stoughton. Nine parcels in Fall River, one parcel in Raynham and three parcels in Stoughton would be affected by job displacement and associated job loss. The actual numbers of jobs that would be lost from each of these businesses is not known, but it is expected to be negligible in comparison to the number of workers present in these communities. As shown in Table 4.3-19, the work force in Fall River is estimated to be 36,989, while the Raynham and Stoughton work forces are estimated to be 8,788 and 14,523, respectively.

Table 4.3-19 Workforce in Communities with Stations

Municipality	Workforce	Station	Job Loss
Canton	21,372	Canton Center	No
		Canton Junction	No
Easton	12,627	North Easton	No
		Easton Village	No
Fall River	36,989	Battleship Cove	No
		Fall River Depot	**Yes**
Freetown	3,757	Freetown	No
New Bedford	37,223	King's Highway	No
		Whale's Tooth	No
Raynham	8,788	**Raynham Park**	**Yes**
Stoughton	14,523	**Stoughton**	**Yes**
Taunton	25,653	Taunton	No
		Dana Street	No
		Taunton Depot	No

Source: Metropolitan Area Planning Council (MAPC) *MAPC Projections 013106* (2010 employment projections for Canton, Sharon, and Stoughton) South Coast Regional Planning and Economic Development District (SRPEDD) *Community Quickstats* (summer 2007 employment estimates for all other communities)

4.3.3.9 Layover Facilities

Two overnight layover facilities are planned for the Southern Triangle: one each at or near the end of the Fall River Secondary and the New Bedford Main Line. The Wamsutta site was selected as the preferred layover facility for the New Bedford Main Line and Weaver's Cove East site was selected for the Fall River Secondary. This section provides basic descriptions of each layover facility site and a list of the parcels to be acquired, in whole or in part, to construct these facilities for the South Coast Rail project. This evaluation does not consider neighborhood fragmentation, as the layover facilities would not be linear facilities dividing communities.

Wamsutta

The Wamsutta site layover facility would be constructed along the New Bedford Main Line and would serve all Build Alternatives. It would be located in New Bedford near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main Line, just north of the Whale's Tooth Station.

The Wamsutta site layover facility alternative location is a previously developed site, currently used as a rail yard for CSX, within an industrial area. The layover facility at the Wamsutta site would require acquisition of 5.90 acres (one parcel) of publicly owned land. The parcel that would be acquired to construct this layover facility is listed in Table 4.3-20 and shown in Figure 4.2-37.

Table 4.3-20 Layover Facility at the Wamsutta Site: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
72-275	Public	Industrial	Undeveloped	N/A	No	5.90	54

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

No residential, business, or community facility displacements would result from this acquisition for the Wamsutta site.

Parcel number 72-275 is owned by Housing 70 Corporation (the City of New Bedford); no property tax revenue loss would result from acquiring this parcel.

Weaver's Cove East

The Weaver's Cove East site layover facility would be constructed along the Fall River Secondary and would serve all Build Alternatives. It would be located in Fall River west of Main Street between the existing Fall River Secondary and Main Street, approximately 2.5 miles from the southern terminus of the Fall River Secondary.

Currently vacant land, a portion of the Weaver's Cove East site was previously developed. Approximately one-half of the site is cleared of vegetation or includes remnant building foundations; the remainder of the site is vegetated. Surrounding land to the north, east, and south is residential; industrial land use is present to the southwest. Undeveloped land is immediately west of the site, adjoining the Taunton River. The parcels that would be acquired to construct a layover facility at the Weaver's Cove East site are listed in Table 4.3-21 below and shown in Figure 4.2-38.

Table 4.3-21 Layover Facility at the Weaver's Cove East Site: Land Acquisition

Parcel Number	Ownership	Generalized Zoning	General Land Use	Property Tax Revenue Loss	Job Loss	Area (acres)	Percent Acquisition
T-15-33[1]	Private	Industrial	Undeveloped	$16,900	No	13.80	90.0
T-1-38	Private	Industrial	Undeveloped	$46,311	No	4.63	100.0
TOTAL				**$63,211**		**18.43**	

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
Note: Additional property tax revenue losses may result from small and/or partial acquisitions that cannot be determined at this phase.
1 Parcel T-15-33 incorporates Parcel T-15-1 in the City of Fall River Assessor's records. Figure 4.2-38 depicts both parcels.

The layover facility at the Weaver's Cove East site would require 18.43acres (two parcels) of privately owned land. No residential, business, or community facility displacements would result from these acquisitions for the Weaver's Cove East site.

Parcel number T-1-38 would be wholly acquired and parcel number T-15-38 would be nearly wholly acquired; property tax revenue losses for the City of Fall River are estimated at $63,211 per year, in 2013 dollars.

Summary of Effects Associated with Layover Facility

Tax effects of the layover site alternatives are listed in Table 4.3-22. The Wamsutta Layover facility would result in no tax losses in New Bedford, while tax losses in Fall River resulting from the Weaver's Cove Layover Facility would be $63,211.

Table 4.3-22 Summary of Layover Facility Potential Effects to the Social and Economic Environment

Candidate Layover Facility Site	Property Tax Revenue Loss	Job Loss	Neighborhood Fragmentation	Residential Property Value Increase
Wamsutta Site	N/A	No	NA	NA
Weaver's Cove East Site	$63,211	No	NA	NA

NA Not applicable

4.3.3.10 Temporary Construction Impacts

The construction associated with the proposed project would support temporary jobs in the South Coast region in construction and related industries during the estimated four-year construction period. Construction job estimates are based on the Corridor Plan, which presents total economic impacts for four study areas: (1) Taunton and communities south; (2) Northern communities; (3) Boston Cambridge; and (4) rest of Massachusetts.

Based upon the preliminary estimates of construction costs, the Corridor Plan suggests that "the total direct, indirect and induced economic effects within the Commonwealth of Massachusetts of the rail alternatives would include about $1.4 billion to $1.8 billion in business output, which would in turn generate 6,800 to 7,800 person-year jobs, and $314 to $360 million in household income."

Delays would likely occur during construction activities and access to businesses could be temporarily affected. Coordination to keep local governments and business owners apprised of construction plans would serve to minimize temporary construction disruptions to business access.

4.3.4 Summary

This section summarizes the effects to the social and economic environment potentially resulting from implementing each of the South Coast Rail project alternatives, based upon preliminary engineering plans. The summaries of parcel acquisition and potentially resulting property tax revenue loss and job loss focus on privately owned parcels, as acquisition of publicly owned parcels would not impact these aspects of the social and economic environment.

4.3.4.1 Stoughton Electric Alternative

By Element

The Stoughton Electric Alternative would be comprised of the elements listed in Table 4.3-23, which also summarize the potential impacts to land uses and the social and economic environment, respectively, that may result from implementing this alternative.

Property tax revenue losses as a result of the Stoughton Electric Alternative are estimated at $197,251 per year, in 2013 dollars; additional property tax revenue losses may result from small and/or partial acquisitions.

Four residences would be displaced. Based on average household size in the affected communities, nine persons would be relocated. Six businesses would be displaced by the Stoughton Electric Alternative. Job losses are expected from business displacements resulting from acquisition of privately owned commercial buildings.

Based on a review of residential and commercial property availability,[36] communities that would be impacted by residential displacements or business displacements have sufficient real estate capacity to absorb these displacements. Affected property owners would be provided compensation/relocation assistance in accordance with federal and state requirements.

Table 4.3-23 Stoughton Electric Alternative: Summary of Potential Effects to the Social and Economic Environment

Element/Component	Property Tax Revenue Loss	Neighborhood Fragmentation	Residential Displacement (homes)	Business Displacement	Job Loss
Railroad Alignments					
Northeast Corridor	-	None	-	-	No
Stoughton Line	$7,030	Moderate	1	-	No
Fall River Secondary	$4,725	None	3	-	No
New Bedford Main	TBD	None	-	-	No
Stations					
Canton Junction	-	NA	-	-	No
Canton Center	-	NA	-	-	No
Stoughton	$22,493	NA	-	2	Yes
North Easton	$6,893	NA	-	-	No
Easton Village	TBD	NA	-	-	No
Raynham Park	$7,030	NA	-	-	No
Taunton	$14,986	NA	-	-	No
Taunton Depot	$106	NA	-	-	No
Freetown	TBD	NA	-	-	No
Fall River Depot	$70,777	NA	-	4	Yes
Battleship Cove	-	NA	-	-	No
King's Highway	-	NA	-	-	No
Whale's Tooth	-	NA	-	-	No
Layover Facilities					
Wamsutta	-	NA	-	-	No
Weaver's Cove East	$63,211	NA	-	-	No
TOTAL/SUMMARY	**$197,251**	**Moderate**	**4**	**6**	**Yes**

TBD To be determined.
NA Not applicable.
Note: Additional property tax revenue losses may result from small and/or partial acquisitions

Moderate neighborhood fragmentation is expected to result from implementation of this alternative. Along the inactive portion of the Stoughton Line, some residential and commercial activity encroachment into the right-of-way has occurred in Stoughton, Easton, Taunton, and Raynham. The railroad has been out of service for some 50 years between Stoughton Station and Raynham Junction, and nearly 100 years between Raynham Junction and Longmeadow Street in Taunton. Over time, some

[36] Online research of residential real estate property availability conducted by reviewing current listings of similar homes (based on zoning of affected properties) in the affected communities at www.realtor.com. Commercial real estate vacancy rates conducted by telephone inquiries to chambers of commerce in the affected communities.

neighborhoods on either side of the alignment have developed continuity across the inactive railroad bed as residents have used the alignment for pedestrian transit to neighbors or commercial districts within walking distance. Re-establishing rail service would include safety fencing along the railroad right-of-way through high-density residential and commercial districts, preventing such informal use of the railroad bed as a path. Additionally, motorists, pedestrians, and bicyclists would be temporarily delayed at at-grade railroad crossings when trains pass, potentially disrupting car-based transit between neighborhoods.

By Municipality

Table 4.3-24 summarizes the private property acquisitions for rights-of-way, stations and layover facilities, as well as annual property tax revenue losses and job losses for each affected municipality that would result from the parcel acquisitions in excess of 50 percent for the Stoughton Electric Alternative. Most acquisitions associated with rights-of-way and traction power facilities are not estimated.

Table 4.3-24 Stoughton Electric Alternative: Property Tax Revenue and Job Losses for Affected Municipalities

Municipality	Component	Private Property Acquisition Area (acres)	Property Tax Revenue Loss[1]	Job Loss
Canton	Canton Center	-	-	No
Easton	North Easton	10.24	$6,893	No
Fall River	Battleship Cove	-	-	No
	Fall River Depot	5.11	$70,777	Yes
	Weaver's Cove East	18.43	$63,211	No
Freetown	Freetown	4.18	TBD	No
New Bedford	Whale's Tooth	-	-	No
	Wamsutta	5.90	-	No
Raynham	Raynham Park	11.90	$7,030	Yes
Stoughton	Stoughton	7.44	$22,493	Yes
Taunton	Taunton	11.82	$14,986	No
	Taunton Depot	11.53	$106	No

TBD To be determined.
Note: Additional property tax revenue losses may result from small and/or partial acquisitions.

4.3.4.2 Stoughton Diesel Alternative

The Stoughton Diesel Alternative would be comprised of the same elements as the Stoughton Electric Alternative as listed above, but would not need electrical infrastructure. The property acquisitions needed for the Stoughton Diesel Alternative are therefore 1.1 acres smaller than for the Stoughton Electric Alternative. The other effects to the social and economic environment that would result from the Stoughton Diesel Alternative (such as property acquisitions for stations, layover facilities, right-of-way, property tax revenue loss, residential and business displacements) are identical to those that would result from the Stoughton Electric Alternative, as provided in Tables 4.3-23 and 4.3-24.

4.3.4.3 Whittenton Electric Alternative

By Element

The Whittenton Electric Alternative (Figure 1.4-3) would be comprised of the elements listed in Table 4.3-25, which also summarize the land acquisition requirements and potential impacts to the social and economic environment, respectively, that may result from implementing this alternative.

Property tax revenue losses as a result of the Whittenton Electric Alternative are estimated at $181,351 per year, in 2013 dollars; additional property tax revenue losses may result from small and/or partial acquisitions that were not estimated.

Three residences would be displaced by the Whittenton Electric Alternative, for the Fall River Secondary right-of-way acquisition at Myricks Junction. Based on average household size in the Berkley, nine persons would be relocated. Four businesses would also be displaced by the Whittenton Electric Alternative for the Fall River Depot Station, and two potential business displacements would result from development of the new Stoughton Station. Job losses are expected from business displacements resulting from acquisition of privately owned commercial buildings, but are not quantifiable at this time.

Based on a review of residential and commercial property availability,[37] communities that would be impacted by residential displacements or business displacements have sufficient real estate capacity to absorb these displacements. Affected property owners would be provided compensation/relocation assistance in accordance with federal and state requirements.

Moderate neighborhood fragmentation is expected to result from implementation of this alternative. Neighborhood fragmentation within the Stoughton Line portion would be as described in the Operations Impacts section. The inactive Whittenton Branch has been out of service for some 50 years. However, neighborhoods on either side of the alignment do not appear to have developed substantive continuity across the inactive railroad bed, partially due to the industrial nature of parcels on either side of the corridor, and partially because portions of the corridor in residential areas are located in a cut section with steep-sided banks, wherein disposal of yard waste and other refuse (rather than pathways to promote neighborhood continuity) has been the primary use of the embankment. Motorists, pedestrians, and bicyclists would be temporarily delayed at at-grade railroad crossings when trains pass, but this effect is not expected to impact continuity among neighborhoods along the Whittenton Branch.

By Municipality

Table 4.3-26 summarizes the private property acquisitions for rights-of-way and stations, annual property tax revenue losses, and job losses for each affected municipality that would result from the parcel acquisitions in excess of 50 percent for the Whittenton Electric Alternative.

[37] Online research of residential real estate property availability conducted by reviewing current listings of similar homes (based on zoning of affected properties) in the affected communities at www.realtor.com. Commercial real estate vacancy rates conducted by telephone inquiries to chambers of commerce in the affected communities.

Table 4.3-25 Whittenton Electric Alternative: Summary of Potential Effects to the Social and Economic Environment

Element/Component	Property Tax Revenue Loss	Neighborhood Fragmentation	Residential Displacement (homes)	Business Displacement	Job Loss
Railroad Alignments					
Northeast Corridor	-	-	-	-	-
Stoughton Line	TBD	Moderate	-	-	No
Whittenton Branch	TBD	Minimal	-	-	No
Attleboro Secondary	TBD	None	-	-	No
Fall River Secondary	$4,729	None	3	-	No
New Bedford Main Line	TBD	None	-	-	No
Stations					
Canton Junction	-	NA	-	-	No
Canton Center	-	NA	-	-	No
Stoughton	$22,493	NA	-	2	Yes
North Easton	$6,893	NA	-	-	No
Easton Village	-	NA	-	-	No
Raynham Park	$7,030	NA	-	-	No
Dana Street	$6,112	NA	-	-	No
Taunton Depot	$106	NA	-	-	No
Freetown	TBD	NA	-	-	No
Fall River Depot	$70,777	NA	-	4	Yes
Battleship Cove	-	NA	-	-	No
King's Highway	-	NA	-	-	No
Whale's Tooth	-	NA	-	-	No
Layover Facilities					
Wamsutta	-	NA	-	-	No
Weaver's Cove East	$63,211	NA	-	-	No
TOTAL/SUMMARY	**$181,351**	**Moderate**	**3**	**6**	**Yes**

TBD To be determined.
NA Not applicable.
Note: Additional property tax revenue losses may result from small and/or partial acquisitions.

Table 4.3-26 Whittenton Electric Alternative: Property Tax Revenue and Job Losses for Affected Municipalities

Municipality	Component	Private Property Acquisition Area (acres)	Property Tax Revenue Loss	Job Loss
Canton	Canton Center	-	-	No
Easton	North Easton	10.24	$6,893	No
Fall River	Battleship Cove	-	-	No
	Fall River Depot	5.11	$70,777	Yes
	Weaver's Cove East	18.43	$63,211	No
Freetown	Freetown	4.18	TBD	No
New Bedford	Whale's Tooth	-	-	No
	Wamsutta	5.90	-	No
Raynham	Raynham Park	11.90	$7,030	Yes
Stoughton	Stoughton	7.44	$22,493	Yes
Taunton	Dana Street	4.09	$6,112	No
	Taunton Depot	11.53	$106	No

TBD To be determined.
Note: Additional property tax revenue losses may result from small and/or partial acquisitions.

4.3.4.4 Whittenton Diesel Alternative

The Whittenton Diesel Alternative would be comprised of the same elements as the Whittenton Electric Alternative as listed above but would not need electrical infrastructure. The area needed for the Whittenton Diesel Alternative is therefore somewhat smaller than for the Whittenton Electric Alternative. The other effects to the social and economic environment that would result from the Whittenton Diesel Alternative are identical to those that would result from the Whittenton Electric Alternative, as provided in Tables 4.3-25 and 4.3-26.

4.3.4.5 Summary Comparison

Table 4.3-27 provides a summary comparison of socioeconomic impacts by community. Also included in Table 4.3-27 are estimated fiscal year 2009 tax levies for each municipality, to allow for comparison of the estimated property value loss to the total tax revenues. For most communities, the anticipated property tax revenue loss is on the order of 0.02 percent, although Fall River would experience up to 0.2 percent loss of property tax revenue. The size of the property tax revenue losses are not expected to put substantial upward pressure on local tax rates and these impacts would be at least partially offset by additional tax revenue associated with economic development/redevelopment in the vicinity of the proposed stations as outlined in the Corridor Plan, as discussed further below.

Table 4.3-27 Comparison of Social and Economic Effects to Municipalities, by Alternative

Municipality	Stoughton Alternatives	Whittenton Alternatives
Canton		
Private Property Acquisition (acres)	-	-
Property Tax Revenue Loss	-	-
Total Canton Tax Levy, 2009: $50,759, 822		
Percent Loss	0	0
Direct Job Loss	No	No
Easton		
Private Property Acquisition (acres)	10.24	10.24
Property Tax Revenue Loss	$6,893	$6,893
Total Easton Tax Levy, 2009: $39,433,261		
Percent Loss	0.02	0.02
Direct Job Loss	No	No
Fall River		
Private Property Acquisition (acres)	23.54	23.54
Property Tax Revenue Loss	$133,988	$133,988
Total Fall River Tax Levy, 2009: $64,257,886		
Percent Loss	0.2	0.2
Direct Job Loss	Yes	Yes
Freetown		
Private Property Acquisition (acres)	4.18	4.18
Property Tax Revenue Loss	TBD	TBD
Total Freetown Tax Levy, 2009: $13,809,232		
Percent Loss	TBD	TBD
Direct Job Loss	No	No
New Bedford		
Private Property Acquisition (acres)	5.90	5.90
Property Tax Revenue Loss	-	-
Total New Bedford Tax Levy, 2009: $88,797,309		
Percent Loss	-	-
Direct Job Loss	No	No
Raynham		
Private Property Acquisition (acres)	11.90	11.90
Property Tax Revenue Loss	$7,030	$7,030
Total Raynham Tax Levy, 2009: $24,264,578		
Percent Loss	0.02	0.02
Direct Job Loss	No	No
Stoughton		
Private Property Acquisition (acres)	7.44	7.44
Property Tax Revenue Loss	$22,493	$22,493
Total Stoughton Tax Levy, 2009:		

Municipality	Stoughton Alternatives	Whittenton Alternatives
$44,788,089		
Percent Loss	0.05	0.05
Direct Job Loss	No	No
Taunton		
Private Property Acquisition (acres)	23.35	15.91
Property Tax Revenue Loss	$15,092	$21,098
Total Taunton Tax Levy, 2009: $63,756,063		
Percent Loss	0.02	0.03
Direct Job Loss	No	No

Tax Revenue Impacts

The Corridor Plan graphically presents per-capita property tax receipts for selected South Coast communities in 2006.[38] These data indicate that tax receipts for communities that currently do not have train service (such as Fall River, New Bedford, and Taunton) are lower than for communities that currently do have train service (such as Attleboro, Foxborough, and Sharon). The effects of the current (2009) economic downturn on tax revenues at the municipal level are unknown at this time, nor is it possible to predict tax revenues at the municipal or state levels in 2030 with any precision.

The direct property tax revenue losses for affected communities would be insignificant as compared to the total property tax receipts for each town. Property acquisitions (converting privately owned parcels to publicly owned, thereby eliminating the property tax generated) would be minimal, and few business or residential displacements would result from any of the alternatives.

Indirectly, property values are expected to increase near station sites due to increased access to transit but decrease along the rail alternative alignments due to increased noise levels from train operations. It is assumed that residential property values would increase by 5 to 25 percent for residences within 1 mile of new station sites and decrease by up to 20 percent within about 400 feet of the alignments or layover facilities. It is not possible to predict with any precision the property tax revenue changes that may result for each community.

The Corridor Plan indicates that, under Scenario 1, the South Coast Rail project would indirectly generate between $16 million and $18 million in net new state taxes and $8.5 million to $9.5 million in net new local business property taxes each year by 2030 as compared to the No Build Alternative.[39] The estimated overall growth (forecast regional growth plus growth attracted to station sites and new induced growth) near rail stations would result in $62 million to $77 million in local property taxes.[40]

Implementing the Smart Growth initiatives in Scenario 2 is expected to change the location of economic impacts such as property tax revenue sources in each affected community, but is not expected to

[38] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. See Appendix E: Baseline Report: Economic Development and Land Use Conditions in the South Coast Region Today, Chapter IV Economic Development Baseline, Figure 36: Per Capita Property Tax Receipts (All) 2006.

[39] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. See Chapter 5, Potential Economic Effects of South Coast Rail.

[40] Ibid. See in Table 5-2, Estimated Growth Near SCR Commuter Rail Stations by 2030.

change the overall (regional) impacts as compared to Scenario 1. See Chapter 5 for further information on indirect effects, and Scenario 1 and 2.

4.4 ENVIRONMENTAL JUSTICE

4.4.1 Introduction

This chapter identifies environmental justice populations within and adjacent to the South Coast Rail alternatives corridors and evaluates potential impacts to these populations that may result from the proposed South Coast Rail alternatives.

4.4.1.1 Resource Definition

Environmental justice is an important element of policy-making in transportation planning. Environmental justice policies focus on improving the natural environment in traditionally underserved communities, addressing disproportionate adverse environmental impacts that exist in those communities, and providing enhanced opportunities for participation in the decision-making process for those actions that may result in beneficial and/or adverse effects. One of the South Coast Rail project's goals is to improve transit services which would also likely provide benefits to environmental justice populations in terms of improved mobility and regional access.

Massachusetts's environmental justice policy[1] characterizes environmental justice populations as neighborhoods, comprised of block groups defined by the U.S. Census Bureau, which meet one or more of the following criteria:

- Median annual household incomes are at or below 65 percent of the statewide median ($30,515 in 2000);
- Minority residents comprise 25 percent or more of the population;
- Foreign-born residents comprise 25 percent or more of the population; or
- Residents with limited English language proficiency represent 25 percent or more of the population.

4.4.1.2 Regulatory Context

The *Environmental Justice Policy*[2] of the Massachusetts EEA[3] is an effort to protect the environment and public health in the Commonwealth. Environmental justice is based on the principle that all people have the right to be protected from environmental pollution and to live in and enjoy a clean and healthful environment. EEA's *Environmental Justice Policy* makes environmental justice an integral consideration in the implementation of all state environmental programs including, but not limited to, granting financial resources, implementing and enforcing laws, regulations, and policies, and providing access to both active and passive open space. The policy focuses attention on minority and low-income neighborhoods in Massachusetts where residents have traditionally been unaware of or unable to participate in environmental decision-making or to gain access to state environmental resources.

[1] Executive Office of Energy and Environmental Affairs (EEA). 2002. Environmental Justice Policy of the Massachusetts Office of Energy and Environmental Affairs. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs.

[2] EEA. 2002. Environmental Justice Policy of the Massachusetts Office of Energy and Environmental Affairs, Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs.

[3] Formerly known as the Massachusetts Executive Office of Environmental Affairs.

This chapter addresses the requirements of the statutes, regulations, and guidance documents listed below.

- Executive Order (EO) 12898[4] states "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations."

- The Army Corps of Engineers, in complying with EO 12898, utilizes the guidance provided by the USEPA. USEPA defines environmental justice as "The fair treatment and meaningful involvement of all people, regardless of race, color, national origin or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socio-economic groups should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs and policies."[5] USEPA has responsibility for the consideration of environmental justice in Clean Air Act reviews.

- The Federal Transit Administration (FTA), Federal Railroad Administration (FRA) and Federal Highway Administration (FHWA) are U.S. Department of Transportation (DOT) agencies which are Cooperating Agencies for this Federal Action. U.S. DOT Order 5610.2,[6] Environmental Justice in Minority and Low-Income Populations, requires all DOT agencies to determine whether activities will have an adverse impact on minority and low-income populations. DOT agencies must determine if adverse effects are predominantly borne by a low-income or minority population and if adverse effects are appreciably more severe than the adverse effect that would be suffered by the non-minority or non-low-income population.

The Secretary of the Executive Office of the EEA issued a Certificate on the ENF on April 3, 2009. Included in the Certificate are a number of requirements defining the scope of the DEIR, including environmental justice:

- The DEIR should define and include maps identifying the location of environmental justice populations in the project area.

- The DEIR should describe specifically how the project will provide tangible benefits to environmental justice communities identified in the ENF.

- The DEIR should identify any potential for disproportionate impacts on environmental justice communities that may result from the proposed project, including with regard to traditional cultural properties, and any specific proposed mitigation. This includes

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[4] Clinton, President William J. 1994. Executive Order: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The White House: Washington, DC.

[5] Environmental Protection Agency. 1998. Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis. EPA, Office of Federal Activities. Washington, DC.

[6] US Department of Transportation. 1997. Department of Transportation (DOT) Order to Address Environmental Justice in Minority Populations and Low-Income Populations. Federal Register, Vol. 62, No. 72, pages 18377-18381. Washington, DC. The DOT Order was revised in May 2012- http://www.fhwa.dot.gov/environment/environmental_justice/ej_at_dot/order_56102a/index.cfm.

identifying potential adverse effects on any traditional cultural properties of significance to Native American Tribes, and mitigation. The DEIR should include a list of specific mitigation commitments to address noise and vibration impacts to environmental justice neighborhoods. Mitigation should include specific commitments on how [increased property values in environmental justice communities] will be addressed, and specify how [financial impacts to environmental justice communities in Fall River as a result of property acquisition] will be mitigated as part of the project.

- The DEIR should include an update on MassDOT's outreach efforts to environmental justice populations.
- The DEIR should evaluate safety impacts in the context of the *Environmental Justice Policy* including strategies to enhance public participation in the environmental review process. [7]

The Secretary's Certificate on the DEIR/DEIS required further analysis or discussion of certain impacts to environmental justice populations in the FEIR. The Certificate stated that the FEIR should:

- Include a list of specific mitigation commitments to address noise and vibration impacts to environmental justice neighborhoods;
- Include an update on the investigation of potential adverse effects on any traditional cultural properties of significance to Native American Tribes. The FEIR should clarify if there will be a disproportionate adverse impact to an environmental justice community with regard to traditional cultural properties, and if so, what mitigation will be implemented;[8]
- Specify how financial impacts to environmental justice communities in Fall River as a result of property acquisition] will be mitigated as part of the project;
- Include further discussion and specific commitments on how [increased property values in environmental justice communities] will be addressed (for example, clear commitments to affordable housing as part of the project's station TOD plans, or other measures);
- Include an update on MassDOT's outreach efforts to environmental justice populations; and
- Evaluate safety impacts in the context of EEA's Environmental Justice policy.

4.4.1.3 Methodology

This section summarizes the methodology used to evaluate the potential direct (occurring at the same time and place as the action) and indirect effects (removed in time and space from the action, but still reasonably foreseeable) of the South Coast Rail project on environmental justice populations.

Evaluation of Direct Effects

Potential direct effects to environmental justice populations were evaluated for residence or job losses due to property acquisition, neighborhood fragmentation, increases in noise levels and impacts to other

[7] Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. South Coast Rail Project. April 3, 2009.

[8] Refer to Chapter 4.8 Cultural Resources for all information pertaining to traditional cultural properties.

resources. If any impacts to these resources in environmental justice neighborhoods were found to be substantive, then a comparison of impacts to non-environmental justice neighborhoods was made to determine if the significant adverse impact would be predominantly borne by environmental justice populations or whether it is appreciably more severe or greater in magnitude than the adverse impact that will be suffered by the non-environmental justice population in the same community. Environmental justice neighborhoods were defined at the Census block group level based on median household income, presence of those who identify themselves as being of a minority, foreign-born residents, and those with limited English proficiency.

Property acquisition requirements in environmental justice neighborhoods were identified by reviewing areas where construction would be required for each of the alternatives with respect to those neighborhoods to determine where the rail corridors, stations, or layover facilities would pass through or be located within them. For the purposes of this evaluation, "construction" is defined as upgrading existing rail lines, reconstructing removed rail lines along out-of-service railroad alignments, constructing new railroads, replacing existing railroad bridges and culverts, constructing new permanent or temporary railroad bridges, reconfiguring at-grade road/railroad crossings, and constructing new grade-separated road/railroad crossings. Environmental justice neighborhoods were outlined by Census block group according to the criteria cited above, and plotted on aerial photographs with the preliminary plans of each alternative for the evaluation.

"Property Acquisition" is defined as taking a greater than 500-square-foot portion, or a sliver greater than 10 feet wide, of any parcel outside of the existing right-of-way to accommodate permanent impacts, and is based upon preliminary engineering plans. Temporary construction impacts outside of the existing right-of-way would not require property acquisition and are not considered in this evaluation. Slivers less than 10 feet wide or temporary construction easements were not considered in the evaluation of property acquisition because given the scale and accuracy of the preliminary engineering plans, these are likely to be eliminated in final design. Maps and aerial photographs were examined in reference to preliminary engineering plans to identify encroachments into environmental justice neighborhoods. Final engineering plans may show an increase or decrease of the actual area of acquisition required. Adverse impacts to environmental justice populations were determined if the property acquisition would result in loss of residences or jobs. Such impacts would be further characterized as substantive if they represent a large portion of total residencies or jobs in a community and are located in a neighborhood with a high concentration of low-income and/or minority residents.

Neighborhood fragmentation was evaluated by examining aerial photographs and observing environmental justice neighborhoods to qualitatively determine if neighborhood continuity across the alignments would be disrupted by any of the alternatives.

Selected other environmental impacts to environmental justice populations were also evaluated. Because disproportionate impacts to environmental justice communities are predicated on the potential for significant impacts in other environmental categories, only the environmental impact categories with significant impacts under the Build Alternatives were studied in detail in this analysis. The specific topics included in the environmental justice assessment are: socioeconomics, noise, and vibration. Issues related to traditional cultural properties are addressed in Chapter 4.8, *Cultural Resources*. Direct impacts to environmental justice populations from changes in these other resources were evaluated in relationship to the environmental justice neighborhoods.

For each of these resource areas, substantive adverse impacts in environmental justice neighborhoods were compared with impacts in non-environmental justice neighborhoods to determine if environmental justice populations would be disproportionately impacted. This comparison of adverse impacts was conducted on a regional basis (the South Coast Rail study area) to coincide with the evaluation of regional benefits that would be realized by environmental justice populations as indirect effects, described below.

The following topics would not have the potential to result in significant adverse impacts on environmental justice populations and were not evaluated in detail as part of this environmental justice assessment:

- Chapter 4.9, *Air Quality*, includes a review of ambient air quality and modeled emissions from the trains to identify where adverse impacts to air quality would occur, including within environmental justice neighborhoods. The study concluded that the electric train alternatives would not adversely impact local air quality, and the diesel train alternatives' impact would be very small (less than a 1.5-percent increase in pollutant levels) and would not result in air pollutant concentrations in excess of the National Ambient Air Quality Standards (NAAQS). Based on this conclusion, there would be no air quality impacts to environmental justice populations.

- Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*, identifies where acquisition of protected open space or publicly owned parcels within ACECs would adversely impact these properties. While the alternatives do involve the acquisition of protected open space, these acquisitions do not occur in environmental justice areas and thus do not have the potential to disproportionally impact environmental justice populations.

Temporary impacts were not evaluated in detail because they would be mitigated through construction best management practices and any impacts after mitigation would not have a lasting effect on adjacent communities.

Evaluation of Indirect Effects

Potential indirect effects to environmental justice populations were also evaluated based on the review of station alternatives with respect to environmental justice neighborhoods. This analysis also included a review of indirect impacts to environmental justice populations in nearby communities likely served by the stations. Potential benefits to environmental justice communities are an indirect effect of the South Coast Rail project. A study[9] conducted by the Central Transportation Planning Staff (CTPS) of the Boston Metropolitan Planning Organization examined how the South Coast Rail alternatives would affect travel accessibility and mobility for environmental justice populations in Taunton, Fall River, and New Bedford. Results of that study are incorporated in this chapter; the study is provided in Appendix 4.4-A.

Potential indirect socioeconomic impacts due to changes in property values were evaluated qualitatively through reference to the *South Coast Rail Economic Development and Land Use Corridor Plan* and the applicable literature.

[9] CTPS. 2009. *South Coast Rail Environmental Justice Study*. Memorandum from CTPS to the South Coast Rail Project Interested Parties. Boston Metropolitan Planning Organization, Central Transportation Planning Staff: Boston.

4.4.2 Existing Conditions

This section discusses the presence of minority, foreign-born, low-income and limited English language proficiency populations within the study area for the South Coast Rail project.

4.4.2.1 Regional Overview of Environmental Justice Populations

Table 4.4-1 lists the communities that would be served or that could be impacted by the alternatives under consideration.[10] The South Coast Rail alternative railroad alignments pass through or near these 27 communities, and new station sites are within or near each. These communities constitute the environmental justice study area.

Table 4.4-1 Environmental Justice Study Area Communities

Acushnet	Foxborough	Raynham
Attleboro	Freetown	Rehoboth
Berkley	Lakeville	Rochester
Canton	Mansfield	Sharon
Dartmouth	Mattapoisett	Somerset
Dighton	Middleborough	Stoughton
Easton	New Bedford	Swansea
Fairhaven	North Attleborough	Taunton
Fall River	Norton	Westport

Low-income and minority populations in the South Coast Rail environmental justice study area are generally located in densely populated neighborhoods. These neighborhoods are frequently near contaminated sites, abandoned sites, and large sources of air pollution.

Portions of the following eight municipalities within the South Coast Rail environmental justice study area include environmental justice neighborhoods that may be directly affected or benefit from the service provided by the Stoughton or Whittenton Alternatives:

- Canton
- Stoughton
- Taunton
- Fall River
- New Bedford
- Dartmouth
- Fairhaven
- Swanson

Table 4.4-2 provides an overview of state-listed environmental justice communities as a percent of total municipal acreage. Such a designation comes from the regulatory framework for conducting environmental justice analysis in Massachusetts. Tables 4.4-3 and 4.4-4 identify the presence of

[10] The study area includes communities exclusively associated with alternatives included in the DEIS/DEIR but not advanced to the FEIS/FEIR, (Attleboro and Rapid Bus) as described in Chapter 3 – Alternatives. These communities would not be impacted by the Stoughton and Whittenton alternatives analyzed in this FEIS/FEIR.

environmental justice populations (minority, low income, foreign-born, and limited English proficiency) and minority populations, respectively, in these ten communities.

Table 4.4-2 State-Listed Environmental Justice Areas[1] in South Coast Communities

Municipality	Total Municipal Acreage	Acreage within Designated Environmental Justice area	Percent Designated as Environmental Justice Area: Designated Environmental Justice area	Defined By Specific Criteria: Foreign-Born	Low Income	Minority	English Proficiency
Canton	12,489	190	1.5	0.0	0.0	1.5	0.0
Dartmouth	39,653	1,044	2.6	1.6	1.0	0.0	0.0
Fairhaven	7,942	223	2.8	0.0	2.8	0.0	0.0
Fall River	24,668	3,705	15.0	4.5	13.5	1.9	0.2
Mansfield	13,072	879	6.7	0.0	0.0	6.7	0.0
New Bedford	12,979	4,091	31.5	11.6	26.2	20.8	2.6
Stoughton	10,538	1,685	16.0	12.3	0.0	3.0	0.0
Swansea	14,694	999	6.8	0.0	6.8	0.0	0.0
Taunton	30,878	1,165	3.8	0.0	2.3	2.6	0.0

Source: U.S. Census data (2000), MassGIS.
1 Environmental justice areas can be designated based on multiple independent criteria. The table presents the cumulative environmental justice areas for all criteria as well as the total area designated by the specific criteria indicated.

Table 4.4-3 State-Listed Environmental Justice Populations[1] in South Coast Communities

Municipality	Percent of Population Living in Environmental Justice Areas: Defined by Any Criteria	Defined By Specific Criteria: Foreign-Born	Low Income	Minority	English Proficiency
Canton	4.9	0.0	0.0	4.9	0.0
Dartmouth	11.8	7.5	4.3	0.0	0.0
Fairhaven	9.7	0.0	9.7	0.0	0.0
Fall River	57.3	21.6	51.9	8.7	2.8
Mansfield	8.7	0.0	0.0	2.5	0.0
New Bedford	68.2	29.1	55.2	41.7	7.2
Stoughton	10.9	0.9	0.0	1.3	0.0
Swansea	5.7	0.0	5.7	0.0	0.0
Taunton	12.7	0.0	9.7	6.0	0.0

Source: U.S. Census data (2000), MassGIS.
1 Environmental justice areas can be designated based on multiple independent criteria. The table presents the cumulative population in environmental justice areas for all criteria.

As a whole, less than three percent of the land area of the 27 South Coast communities in the study area has an environmental justice neighborhood designation. These environmental justice neighborhoods contain approximately 21 percent of the population of the 27 communities. Approximately 84 percent of the total environmental justice population is located in Fall River or New Bedford, and approximately 45 percent of the environmental justice neighborhood land area is within these two communities.

The eight municipalities are primarily comprised of those who identify themselves as White, with varying shares of those who identify themselves as Black or African American, Asian, American Indian or

Alaska Native, Native Hawaiian or Other Pacific Islander, multiracial, and Hispanic or Latino residents, based on definitions from the U.S. Office of Management and Budget[11] and data from the U.S. Census.[12] Overall, minority populations represent less than 10 percent of the total population in each of the seven municipalities, with the exception of New Bedford where approximately 21 percent of the population identifies itself as a minority and Stoughton where 11.5 percent of the population identifies itself as the same. Each of the eight communities, with the exception of New Bedford, has a smaller percentage of minority populations than the statewide average of 15.5 percent. Those who identify themselves as Hispanic is the most common minority population in Fall River, New Bedford, and Taunton. The minority population in Fairhaven and Swansea is primarily multiracial and Dartmouth is identified as "Other."

Table 4.4-4 Racial and Ethnic Composition of South Coast Communities

		Percent of Population by Race							
Municipality	Total Population	White	Black	American Indian	Asian	Pacific Islander	Other	Multiracial	Hispanic[1]
Canton	20,775	92.5	2.9	0.1	3.0	0.0	0.5	0.9	1.4
Dartmouth	30,666	90.6	1.1	0.2	1.7	0.0	5.0	1.4	1.5
Fairhaven	15,821	96.2	0.6	0.0	0.3	0.0	0.8	2.0	0.5
Fall River	87,395	91.1	2.8	0.2	2.1	0.0	1.3	2.6	3.4
Mansfield	22,414	93.5	2.5	0.2	2.0	0.1	0.2	2.5	0.5
New Bedford	93,065	79.2	4.4	0.5	0.7	0.1	9.1	6.0	10.0
Stoughton	27,149	88.5	5.7	0.1	2.1	0.0	1.3	2.3	1.5
Swansea	15,901	96.3	0.4	0.1	0.8	0.0	0.9	1.6	1.3
Taunton	55,976	91.7	2.1	0.2	0.8	0.0	2.9	2.2	4.1
Statewide Average		84.5	5.4	0.2	3.8	0.0	3.7	2.3	6.8

Source: U.S. Census data (2000), MassGIS.
1 Hispanic populations are generally included as subsets within the other racial categories but are listed separately as well for clarity. Therefore, the percentages for each city will add up to more than 100 percent.

People who are physically, economically, or socially disadvantaged often have less access to an automobile and may face barriers to mobility. The correlation between automobile access and environmental justice populations was evaluated for the South Coast Rail environmental justice study area. Registered motor vehicle data were reviewed for each of the South Coast communities in the environmental justice study area (Table 4.4-5). Decennial Census data from 2000 reveals a negative correlation between environmental justice populations in the study area and the percentage of households reporting registered motor vehicles. Fall River and New Bedford, which have the greatest percentage of their total population being classified as protected under environmental justice regulations, reported the highest percentage of households without motor vehicles, at approximately 21 percent and 22 percent, respectively.

All other study area communities were below the statewide average of 12.7 percent of zero-car households. Fairhaven, Berkley, Rochester, Raynham, Dighton, and Freetown all reported motor vehicle ownership at greater than 97 percent of all households.

[11] http://www.whitehouse.gov/omb/fedreg_1997standards.
[12] "Overview of Race and Hispanic Origin" March 2001.http://www.census.gov/prod/2001pubs/c2kbr01-1.pdf.

Table 4.4-5 South Coast Communities: Percentage of Households with No Registered Motor Vehicles, 2000

Municipality	Percent of Households
Acushnet	5.6
Attleboro	8.1
Berkley	2.2
Canton	6.7
Dartmouth	6.4
Dighton	2.6
Easton	3.8
Fairhaven	7.0
Fall River	20.7
Foxborough	5.1
Freetown	2.9
Lakeville	3.7
Mansfield	5.0
Mattapoisett	3.5
Middleborough	4.8
New Bedford	21.7
North Attleboro	5.6
Norton	4.2
Raynham	2.7
Rehoboth	4.1
Rochester	2.5
Somerset	5.9
Sharon	3.4
Stoughton	5.6
Swansea	4.5
Taunton	9.3
Westport	4.3
Regional Average (of communities listed)	6.2
Statewide Average	12.7

Source: U.S. Census data (2000), MassGIS
Note Communities above the statewide average are identified in bold.

4.4.2.2 Environmental Justice Populations within a 0.5 Mile of Proposed Alternatives

Environmental justice populations within 0.5 mile of the alternative alignments are summarized in Table 4.4-6 and described in subsequent sections. Accompanying figures show communities meeting environmental justice criteria based on minority, foreign-born, low income, and/or limited English proficiency populations along each alternative alignment and near each station.

Southern Triangle

In 2000, the population within 0.5 mile of the Fall River Secondary Rail Segment was 52,021 and the population within 0.5 mile of the New Bedford Main Line Rail Segment was 71,001.[13] As presented on Figures 4.4-1a-e and 4.4-2a-c, environmental justice populations were identified primarily along the southern urban portion of both the New Bedford Main Line and Fall River Secondary in New Bedford and Fall River, respectively. Residents living in these neighborhoods most commonly meet low income and/or minority criteria. Neighborhoods with foreign-born residents were also identified along the New Bedford Main Line between the Acushnet River and the railroad, between Nash Street and Wamsutta Street. Foreign-born and low income residents were also identified south of the end of the Fall River Secondary.

Table 4.4-6 Summaries of State-Listed Environmental Justice Populations within 0.5 Mile of the Alternative Alignments

Alternative Alignment	Percentage of Total Population Living within a Designated Environmental Justice Area–Defined by Any Criterion[1]	Primary Criteria for Designation
Fall River Secondary Rail Segment	36.0	Low Income
New Bedford Main Line Rail Segment	50.4	Minority
Stoughton Electric Alternative and Stoughton Diesel Alternative	9.1	Low Income
Whittenton Electric Alternative and Whittenton Diesel Alternative	9.1	Low Income

Source: U.S. Census data (2000), MassGIS.
The table presents the cumulative environmental justice areas for all criteria.

Stoughton Alternatives

In 2000, the population within 0.5 mile of the Stoughton Alternatives was 88,744. This includes residents along the Stoughton Line from Canton Junction to Weir Junction, and along New Bedford Main Line from Weir Junction to Cotley Junction. Environmental justice populations were identified within 0.5 mile the Stoughton Alternatives under the minority (0.8 percent), foreign-born (0.6 percent), and low income (1.5 percent) criteria. As shown on Figures 4.4-3a-e, environmental justice populations identified along the Stoughton Alternatives are concentrated along the northern portion of the route in Canton (minorities) and Stoughton (foreign-born), and along the southern portion of the alignment in Taunton (low income).

Whittenton Alternatives

In 2000, the population within 0.5 mile of the Whittenton Alternatives was 91,951. This includes the population along the Stoughton Line from Canton Junction to Weir Junction, and the New Bedford Main Line from Weir Junction to Cotley Junction. There are no environmental justice populations within 0.5 mile the Whittenton Branch between Raynham Junction and Whittenton Junction. Environmental justice populations were identified within 0.5 mile of the Whittenton Alternatives under the minority (0.9 percent), foreign-born (0.6 percent), and low income (1.6 percent) criteria. As shown on Figure 4.4-4, environmental justice populations identified along the Whittenton Alternatives are concentrated along the Attleboro Secondary in Taunton. The southernmost environmental justice population (at the

[13] Populations are based on MassGIS data, which presents information in block groups. Included in the calculation of population are all block groups that intersect the 0.5 mile buffer of each alternative alignment and station site.

intersection of the Stoughton Line and Attleboro Secondary, near Weir Junction) meets the low income criteria, while the northern environmental justice area is based on the concentration of minority and low income residents.

Stations

Because the greatest impacts—both adverse and beneficial—to designated environmental justice communities would likely be experienced in those areas within close proximity to proposed stations, a study area of 0.5 mile from proposed stations was identified. This section describes state-listed environmental justice populations within 0.5 mile from proposed station locations (Table 4.4-7).

Table 4.4-7 State-Listed Environmental Justice Populations within 0.5 Mile of the Proposed Station Sites

	Percent of Total Population Living within a Designated Environmental Justice Area[1]				
	Defined by Any	Defined By Specific Criteria			
Station Site	Criterion2	Foreign-Born	Low Income	Minority	English Proficiency3
King's Highway	20.9	0.0	2.6	0.0	0.0
Whale's Tooth	85.6	12.4	24.3	37.6	0.0
Freetown	0.0	0.0	0.0	0.0	0.0
Fall River Depot	50.2	0.0	50.1	5.1	0.0
Battleship Cove	88.7	22.3	14.3	5.5	7.2
Stoughton	26.7	26.7	0.0	0.0	0.0
North Easton	0.0	0.0	0.0	0.0	0.0
Easton Village	0.0	0.0	0.0	0.0	0.0
Raynham Park	0.0	0.0	0.0	0.0	0.0
Taunton (Dean Street)	21.1	0.0	5.8	0.0	0.0
Dana Street	27.7	0.0	17.9	28.6	0.0
Taunton Depot	0.0	0.0	0.0	0.0	0.0

Source: U.S. Census data (2000), MassGIS.

1 Environmental justice areas can be designated based on multiple independent criteria. The table presents the cumulative environmental justice areas for all criteria as well as the total area designated by the specific criteria indicated.

2 MassGIS calculates environmental justice populations assuming the entire sample population within an environmental justice-designated block group is an environmental justice population. If a block group meets one or more environmental justice criteria, then all population within that block group is considered as part of the environmental justice population. Additionally, environmental justice populations may meet one or more criteria for designation; therefore, the total percentage of environmental justice populations defined by any criterion is not a sum of the percentage of each individual criterion.

3 English language proficiency data are calculated based on households, not population, and total household information is not provided for block groups. However, the overall English language proficiency was calculated for the population within 0.5 mile of the Battleship Cove Station assuming the same percentage of households are within each block group, as population (for example, if 10 percent population is within one block group, then 10 percent of the households are within the block group also). When more than one block group reported households meeting the English language proficiency environmental justice criteria, the average percentage was calculated for these block groups.

Station Sites Common to All Rail Alternatives

Both the Stoughton and Whittenton Alternatives would have eleven new commuter rail stations. Ten stations are common to all rail alternatives. The Taunton (Dean Street) Station would be constructed under the Stoughton Alternatives while the Dana Street Station, also in Taunton, would be constructed under the Whittenton Alternatives.

A brief discussion of each station is provided below, including an evaluation of state-listed environmental justice populations within 0.5 mile of each station. Those stations common to both rail alternatives are listed first and the two unique stations are provided at the end of this section.

Stoughton Station—The relocated Stoughton Station would be shifted from its present location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing (see Chapter 3). The proposed station site is privately owned and is currently occupied by commercial and industrial uses, including warehouses/office space used by the Alpha Chemical Company and property of the Murphy Coal Company (fuel storage and materials handling yard, parking lot, and vehicle repair garage).

The Stoughton Station site is surrounded by developed land in the center of Stoughton. Land uses within 0.5 mile of the relocated Stoughton Station include a mix of industrial, commercial, and residential, along with community facilities such as the Stoughton Public Library.

In 2000, the population of Stoughton was 27,149, while the population within 0.5 mile of Stoughton Station was 4,121. Environmental justice neighborhoods were identified within 0.5 mile of the site under the foreign-born (26.7 percent) criterion, as summarized in Table 4.4-7. Environmental justice communities in the vicinity of the relocated Stoughton Station are shown in Figure 4.4-3a. Environmental justice-classified foreign-born residents were identified on the northern, eastern and western sides of the proposed Stoughton station.

King's Highway Station Site—The King's Highway Station, in northern New Bedford along King's Highway east of Route 140, would occupy part of an approximately 55-acre site that is now a shopping plaza. The site would serve walk-in, bike-in, and drive-in customers.

In 2000, the population of New Bedford was 93,768, while the population within 0.5 mile of the King's Highway Station site was 5,866. Environmental justice neighborhoods were identified within 0.5 mile of the site under the low-income (2.6 percent) criteria, as summarized in Table 4.4-7 and shown on Figure 4.4-5. Environmental justice-classified low-income residents were identified along the eastern side of the New Bedford Main Line, approximately 0.5 mile south-southeast of the King's Highway Station site.

Whale's Tooth Station Site—The Whale's Tooth Station, at the Whale's Tooth parking lot, would be sited on an approximately 14-acre parcel on the New Bedford waterfront and was identified as the preferred site in the 2002 Final EIR on South Coast Rail. The City of New Bedford has constructed a parking lot on the site in anticipation of the South Coast Rail project. The station would include intermodal connections, potentially including ferry services. The site would serve walk-in, bike-in and drive-in customers.

In 2000, the population of New Bedford was 93,768, while the population within 0.5 mile of the Whale's Tooth Station site was 10,067. Environmental justice neighborhoods were identified within 0.5 mile of the site under the minority (37.6 percent), foreign-born (12.4 percent) and low-income (24.3 percent) criteria (Table 4.4-7 and Figure 4.4-6). Nearly all residents living within 0.5 mile of the proposed Whale's Tooth Station site are classified as environmental justice populations under the minority and low-income designation. A neighborhood approximately 0.4 mile north of the Whale's Tooth Station site is classified as environmental justice based on foreign-born residents, as well as minority and low-income resident concentrations.

Freetown Station Site—The Freetown Station on South Main Street would be located on an approximately 18-acre site is currently industrial and occupied by a self-storage business, and is near the Fall River Executive Park and the River Front Park. The vicinity of the proposed site is mainly forested, agricultural, and undeveloped, with some residential and industrial uses. The site would serve drive-in customers and customers shuttled between the station and the industrial parks.

In 2000, the population of Freetown was 8,472, while the population within 0.5 mile of the Freetown Station site was 1,002. Environmental justice neighborhoods were not identified within 0.5 mile of the site. Although minority, low-income, foreign-born, and limited English proficiency residents were reported within 0.5 mile of the Freetown Station site, these populations were not reported in concentrations high enough to meet Massachusetts' environmental justice criteria and therefore, are not considered environmental justice neighborhoods.

Fall River Depot Station Site—The Fall River Depot Station, 1 mile north of downtown Fall River at Route 79 and Davol Street, is currently occupied primarily by private commercial and industrial property, although a portion is owned by the City of Fall River.

In 2000, the population of Fall River was 91,938, while the population within 0.5 mile of the Fall River Depot Station site was 9,336. Environmental justice neighborhoods were identified within 0.5 mile of the site under the minority (5.1 percent) and low-income (50.1 percent) criteria (Table 4.4-7 and Figure 4.4-7). Environmental justice populations identified within 0.5 mile of the Fall River Depot Station site are due primarily to the concentrations of low-income residents. Neighborhoods meeting the minority and low-income environmental justice criteria were also identified along the Fall River Secondary, south of the Fall River Depot Station site, between Taylor Street and North Central Street.

Battleship Cove Station Site—The Battleship Cove Station, an approximately 2.2-acre site on the Fall River waterfront behind the Ponte Delgada Plaza, is anticipated to be a platform-only station and would be designed to serve walk-in customers, and pick–up/drop-off customers. The station would serve the downtown area and the Battleship Cove tourist area. The City of Fall River constructed a pick-up/drop-off loop road for the future commuter rail station as part of the Ponte Delgada Plaza.

In 2000, the population of Fall River was 91,938, while the population within 0.5 mile of the Battleship Cove Station site was 12,353. Environmental justice neighborhoods were identified within 0.5 mile of the site under the minority (5.5 percent), low-income (14.3 percent), foreign-born (22.3 percent), and English language proficiency (7.2 percent) criteria (Table 4.4-7 and Figure 4.4-8). Nearly the entire population surrounding the Battleship Cove Station site is classified within one of six environmental justice areas. Residents within 0.5 mile of the Battleship Cove Station site primarily meet the low-income environmental justice criterion, though foreign-born and minority populations are also present to the south.

North Easton Station Site—The North Easton Station would be located at the rear of the Roche Brothers Shopping Plaza. This retail plaza, anchored by a Roche Brothers Supermarket, occupies an approximately 10-acre site. New medical buildings have been constructed nearby and two additional buildings are planned. The station would likely share parking facilities with the medical buildings and would primarily serve drive-in customers, although the station may attract some walk-in customers from the shopping plaza and from nearby residential developments in Stoughton and Easton.

In 2000, the population in Stoughton was 27,149, in Easton 22,299, and the population within 0.5 mile of the North Easton Station site was 6,375. Environmental justice neighborhoods were not identified

within 0.5 mile of the site. Although minority, low-income, foreign-born, and residents with limited English proficiency were reported within 0.5 mile of the North Easton Station site, these populations were not reported in concentrations high enough to meet Massachusetts' environmental justice criteria and, therefore, are not considered environmental justice neighborhoods.

Easton Village Station Site—The Easton Village Station would be sited south of the historic H.H. Richardson train station. The site is limited to the railroad right-of-way and is within walking distance of downtown Easton. The site would be a village-style station serving walk-in and bike-in customers.

In 2000, the population in Easton was 22,299, while the population within 0.5 mile of the Easton Village Station site was 6,831. Environmental justice neighborhoods were not identified within 0.5 mile of the site. Although minority, low income, foreign-born, and residents with limited English proficiency were reported within 0.5 mile of the Easton Village Station site, these populations were not reported in concentrations high enough to meet Massachusetts' environmental justice criteria and therefore, are not considered environmental justice neighborhoods.

Raynham Park Station Site—The Raynham Park Station, at the former Raynham-Taunton Greyhound Park in Raynham, is now occupied by a simulcast/off-track betting facility and has large surface parking lots along Route 138 near the Raynham/Easton town line. The station would be on a portion of this approximately 80-acre site. The site would be designed to serve mostly drive-in customers with additional walk-in customers being drawn from future redevelopment on or near the site.

In 2000, the population of Raynham was 11,739, while the population within 0.5 mile of the Raynham Park Station site was 2,438. Environmental justice neighborhoods were not identified within 0.5 mile of the Raynham Park Station site. Although minority, low income, foreign-born, and limited English language proficiency residents were reported within 0.5 mile of the Raynham Park Station site, these populations were not reported in concentrations high enough to meet Massachusetts' environmental justice criteria and therefore, are not considered environmental justice neighborhoods.

Taunton Depot Station Site—The Taunton Depot Station, at the rear of the Target Plaza, would be located on a site approximately 14 acres in size and accessible via Route 140. The shopping plaza is a newer big-box retail site that contains Target, Home Depot, and other stores. The station would serve customers that drive to the station, as well as potential future walk-in or bike-in customers if redevelopment were to occur.

In 2000, the population of Taunton was 55,976, the population of Berkley was 5,749, and the population within 0.5 mile of the Taunton Depot station site was 6,320. Environmental justice neighborhoods were not identified within 0.5 mile of the site. Although minority, low income, foreign-born, and limited English language proficiency residents were reported within 0.5 mile of the Taunton Depot Station site, these populations were not reported in concentrations high enough to meet Massachusetts' environmental justice criteria and therefore, are not considered environmental justice neighborhoods.

Station Sites that Differ Between the Rail Alternatives

Taunton (Dean Street) Station Site – Stoughton Alternatives—The Taunton Station is at the Dean Street site (Figure 4.4-19). The site is approximately 8 acres and is near Route 44 just north of the historic train station. Downtown Taunton is approximately 0.75 to 1 mile from the site. The site is bounded by Arlington Street, Belmont Street and the existing railroad and is primarily vacant. Currently, parcels comprising the site are owned by the City and by private entities. The City-owned parcel was a former

rubber plant that burned. The City of Taunton has invested in remediating this Brownfield site in anticipation of a future train station. The site is within walking distance of downtown and would be utilized for future TOD. The site would be a multi-modal transportation center serving walk-in, bike-in, and drive-in customers.

Adjacent parcels are forest to the north and east, residential to the west, and commercial to the south. Industrial, institutional (nursing home), and recreational/municipal (ball fields) properties interspersed with forest are east of the railroad right-of-way, and accessed from Longmeadow Road or Dean Street. Moderate-density residential is the predominant land use within 0.5 mile of the Taunton Station site, particularly north and west. A few commercial, industrial, and religious use, and undeveloped parcels are scattered throughout the vicinity.

In 2000, the population of Taunton was 55,976, while the population within 0.5 mile of the Taunton Station site was 8,252. Environmental justice neighborhoods were identified within 0.5 mile of the site under the low-income (5.8 percent) criterion, as summarized in Table 4.4-7 and shown on Figure 4.4-9. Environmental justice areas were identified approximately 0.4 mile west of the Taunton Station site. Residents in this environmental justice area meet the low-income criterion for designation.

Dana Street Station Site – Whittenton Alternatives—The Dana Street Station would be located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton. The site is currently a vacant lot. Surrounding land uses include industrial, residential, and agricultural. The station would serve walk-in, bike-in, and drive-in customers.

In 2000, the population of Taunton was 55,976, while the population within 0.5 mile was 2,882. Environmental justice neighborhoods were identified within 0.5 mile of the proposed Dana Street station site which meet the low income (17.9 percent) and minority (28.6 percent) criteria, summarized in Table 4.4-7 and shown on Figure 4.4-10. The area west of the Dana Street station site is classified as an environmental justice neighborhood based on the percentage of low income and minority residents, but populations immediately adjacent to the station site were not reported in concentrations high enough to meet Massachusetts' environmental justice criteria.

Layover Facilities

Both the Stoughton and Whittenton Alternatives (diesel and electric alternatives) would require two overnight layover facilities—one on the Fall River Branch and one on the New Bedford Main Line.

Weaver's Cove East Facility Site

The proposed Weaver's Cove East site layover facility would be located on the east side of the right-of-way, opposite the formerly proposed Weaver's Cove LNG Site in Fall River (Figure 4.4-11). It would be located approximately 1.5 miles north of Fall River Depot Station and 2.6 miles north of Battleship Cove Station.

Currently vacant land, a portion of the Weaver's Cove East site was previously developed. Approximately one-half of the site is cleared of vegetation or includes remnant building foundations; the remainder of the site is vegetated. Surrounding land to the north, east, and south is residential; industrial land use is present to the southwest. Undeveloped land is immediately west of the site, adjoining the Taunton River. The industrial site to the southwest is a former Shell Oil facility, and

consists of completely cleared land with several large aboveground storage tanks and a short shipping dock.

Although there are no environmental justice communities within the layover site, an environmental justice neighborhood is located south of the proposed layover facility, to the east of the Fall River Secondary Rail Segment. Residents living within this neighborhood meet low income criteria for designation.

Wamsutta Facility Site

The proposed Wamsutta site layover facility would be located on the east side of the right-of-way, opposite the proposed Whale's Tooth Station and adjacent to an existing CSX freight yard (Figure 4.4-12). The site would be located 0.3 mile north of Whale's Tooth Station. The area is primarily characterized by industrial land uses and no commercial or residential properties or open space areas are located within close proximity to this site.

The Wamsutta site layover facility is located within an environmental justice neighborhood that meets low income and minority criteria for designation. Adjacent to the north of the proposed layover facility is an environmental justice neighborhood that also meets foreign-born criteria for designation.

Summary

The data indicate the South Coast Rail environmental justice study area has a substantial environmental justice population based on MassGIS criteria for determining such populations. The area around the Southern Triangle alignments contains the largest percent of the population (36 percent around the Fall River Secondary Rail Segment and 50.4 percent around the New Bedford Main Line Rail Segment) living within environmental justice-designated neighborhoods (as defined by block groups). Environmental justice populations living within 0.5 mile of the alternative alignments are primarily classified based on the low income criterion with the exception of the New Bedford Main Line Rail Segment where minority populations comprise the majority of the environmental justice designations.

MassGIS-designated environmental justice neighborhoods were identified within 0.5 mile of 7 of the 12 proposed station sites (see Table 4.4-8). The area within 0.5 mile of the Battleship Cove Station site in Fall River contains the largest percentage of population living within environmental justice-designated neighborhoods, at 88.7 percent. Low income was identified as the primary criteria for environmental justice designation around these station sites.

In general, the highest concentration of environmental justice populations is present near the southern portion of the Southern Triangle in urban areas of Fall River and New Bedford. The primary criterion for environmental justice designation in these areas is low income, although concentrations of minority and foreign-born residents were also identified in the study area, in particular, around proposed station sites. In many cases, populations met more than one of the environmental justice criteria, such as low income and minority, or foreign-born, minority, and low income. Environmental justice populations identified in New Bedford and Fall River were more widespread and diverse (met more criteria for environmental justice) than the populations in other towns in the South Coast region. Environmental justice populations in the other towns in the South Coast area, such as Canton, Stoughton, or Taunton, had moderate to high concentrations of environmental justice populations meeting one or two criteria for designation.

Table 4.4-8 Summary of State-Listed Environmental Justice Populations within 0.5 Mile of the Proposed Station Sites

Station Sites	Percentage of Total Population Living within a Designated Environmental Justice Area–Defined by Any Criterion[1,2]	Population Living within a Designated Environmental Justice Area–Defined by Any Criterion[1,2]	Primary Criteria for Designation
Stoughton	26.7	520	Foreign Born
King's Highway	20.9	1,213	Low Income
Whale's Tooth	85.6	8,937	Minority
Freetown	0.0	0	N/A
Fall River Depot	50.2	4,652	Low Income
Battleship Cove	88.7	10,965	Foreign-Born
North Easton	0.0	0	N/A
Easton Village	0.0	0	N/A
Raynham Park	0.0	0	N/A
Taunton	21.1	1,857	Low Income
Dana Street	27.7	411	Minority
Taunton Depot	0.0	0	N/A

Source: U.S. Census data (2000), MassGIS.

1 Environmental justice areas can be designated based on multiple independent criteria. The table presents the cumulative environmental justice areas for all criteria.

2 MassGIS calculates environmental justice populations assuming the entire sample population within an environmental justice - designated block group is an environmental justice population. If a block group meets one or more environmental justice criteria, then all population within that block group is considered as part of the environmental justice population. Additionally, environmental justice populations may meet one or more criteria for designation; therefore, the total percentage of environmental justice populations defined by any criterion is not a sum of the percentage of each individual criterion.

4.4.3 Impacts and Mitigation

4.4.3.1 Introduction

This section identifies adverse impacts to environmental justice populations as well as any benefits to these populations that may result from the implementation of the South Coast Rail project. Specifically, the evaluation considered property acquisition, change in noise or vibration levels or air quality, and the presence of traditional cultural properties and open space. If adverse impacts were identified, they were further evaluated to determine if state-listed environmental justice communities would experience a disproportionately high and adverse share of these impacts. The evaluation also considered beneficial effects that may be recognized as a result of the South Coast Rail project. Beneficial impacts include improved access to transit services making it easier to reach employment and educational opportunities, general mobility, and improved air quality.

Detailed information regarding potential impacts is provided in pertinent resource chapters in the FEIS/FEIR, including but not limited to Land Use, Socioeconomics, Transportation, Open Space, Visual Resources, Air Quality, Noise, Vibration, and Indirect Effects and Cumulative Impacts.

4.4.3.2 Property Acquisitions

No-Build (Enhanced Bus Alternative)

The improvements to existing bus service under the No-Build Alternative would not require property acquisitions and therefore there would be no property acquisition-related impacts to environmental justice areas.

Southern Triangle (Common to All Rail Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all rail alternatives. These rail lines form a rough triangular shape running south from Myricks Junction to Fall River (Fall River Secondary Rail Segment) and from Weir Junction through Myricks Junction to New Bedford (New Bedford Main Line), and are therefore referred to as the Southern Triangle (Figure 1.4-1).

Fall River Secondary

Along the Fall River Secondary, one privately owned parcel would be acquired within an environmental justice neighborhood for the right-of-way and one parcel for a traction power facility (for the electric alternatives only) (Table 4.4-9 and Figure 4.4-2c).

Table 4.4-9 Fall River Secondary Environmental Justice Property Acquisition

Municipality	Parcel Number	Ownership	Generalized Zoning	General Land Use	Environmental Justice Categories	Area (acres)
Right-of-Way (All Rail Alternatives)						
Fall River	O-23-4	Private	Industrial	Industrial	Income, Minority	0.02
Traction Power Facility (All Electric Alternatives)						
Fall River	O-22-8	Private	Industrial	Commercial	Income, Minority	0.17
TOTAL (Right-of-Way and Traction Power Facility, All Electric Alternatives)						0.19

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The small portion of the parcel that would be acquired for the right-of-way is along the west side of the Fall River Secondary Rail Segment near the intersection of Davol Street and Cedar Street. The land, which is industrial in nature, is necessary for construction of the upgraded railroad in this segment.

The portion of the parcel that would be acquired for the traction power facility is also along the west side of the Fall River Secondary Rail Segment, adjacent to the proposed Fall River Depot Station. This land is necessary for construction of a parallel substation for the electric alternatives. This parcel is a portion of a vacant industrial property and does not serve residential purposes.

Because of the small size of the acquisitions and the current function of affected parcels, no jobs or residences would be lost. Therefore, no adverse impacts to state-listed environmental justice populations would result.

New Bedford Main Line

One portion of a parcel in an environmental justice neighborhood would be acquired for the New Bedford Main Line right-of-way improvements and one portion of a parcel would be acquired for a traction power facility, as listed in Table 4.4-10 and shown in Figures 4.4-1a and 4.4-1e.

Table 4.4-10 New Bedford Main Line Environmental Justice Property Acquisition

Municipality	Parcel Number	Ownership	Generalized Zoning	General Land Use	Environmental Justice Categories	Area (acres)
Right-of-Way (All Rail Alternatives)						
Taunton	78-188	Public	Industrial	Industrial	Income	0.03
Traction Power Facility (Electric Alternatives)						
New Bedford	84-113	Private	Industrial	Industrial	Income, Minority	0.18
TOTAL (Right-of-Way and Traction Power Facility, Electric Alternatives						**0.21**

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The parcel in Taunton is along the east side of the right-of-way near Weir Junction. The parcel is identified as publicly owned, but is a small portion of an industrial property. A portion of the parcel is required to allow for construction of the upgraded railroad in this segment. There would be no impact to environmental justice populations from acquiring a small portion of this parcel because there would be no residence or job loss.

The parcel in New Bedford is along the west side of the right-of-way near the intersection of the railroad with Purchase Street. The parcel is a portion of a vacant industrial property. The parcel is required to allow for construction of a parallel substation for the electric alternatives. There would be no impact to environmental justice populations from acquiring a small portion of this parcel because there would be no residence or job loss.

Stoughton Alternatives (Electric and Diesel)

The Stoughton Line is currently used for commuter service from Canton to Stoughton. Rail service from there south to Weir Junction was discontinued in the 1950s and some track removed; however, the right-of-way still exists and the southernmost portion is used for freight service. In Stoughton, portions of four parcels in environmental justice neighborhoods would be acquired for the right-of-way; a portion of one parcel in Taunton would be acquired for a traction power facility, as listed in Table 4.4-11 and shown in Figures 4.4-13 and 4.4-3e.

Table 4.4-11 Stoughton Line: Environmental Justice Property Acquisition

Municipality	Parcel Number	Ownership	Generalized Zoning	General Land Use	Environmental Justice Categories	Area (acres)
Right-of-Way						
Stoughton	053-101	Private	Industrial	Commercial	Foreign-Born	0.04
	053-102	Private	Industrial	Commercial	Foreign-Born	0.06
	054-110	Private	Commercial	Industrial	Foreign-Born	0.24
Subtotal (Electric and Diesel Alternatives)						0.41
Traction Power Facility (Electric Alternative)						
Taunton	78-121	Private	Industrial	Undeveloped	Income	0.36
TOTAL (Right-of-Way and Traction Power Facility, Electric Alternative)						0.77

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The four parcels in Stoughton are privately owned and located near the existing Stoughton Station. The parcels, which are vacant commercial/industrial property, are required to allow for construction of the upgraded railroad. The parcel in Taunton is privately owned land on the west side of the Stoughton Line right-of-way near Weir Junction; it is zoned for industrial use but the portion that would be acquired under the Stoughton Electric Alternative is undeveloped land. This portion of the parcel would be used for a parallel substation for the Stoughton Electric Alternative. No jobs or residences would be lost from acquiring these parcels.

Whittenton Alternatives (Electric and Diesel)

The property impacts in Stoughton described above for the Stoughton Alternatives would also occur under the Whittenton Alternatives.

There are no environmental justice areas along the Whittenton Branch. The portion of the Attleboro Secondary that would be used for the Whittenton Alternatives and the siting of the proposed traction power facility in Taunton (Electric Alternative only) would not require property acquisitions from communities that have been identified as having high concentrations of environmental justice populations. Therefore, no adverse impacts to residencies, community facilities, and businesses owned or staffed by environmental justice populations would result.

Stations

No property acquisition impacts in environmental justice areas would be required at the following stations: King's Highway, North Easton, Easton Village, Raynham Park, Taunton Depot, Taunton (Dean St.) and Canton Center Station. Stations with property acquisitions potentially affecting environmental justice areas are described below.

Stoughton—The proposed site of the relocated Stoughton Station is within an environmental justice neighborhood in Stoughton (Figure 4.4-13). The neighborhood meets environmental justice foreign-born criteria.

The relocated Stoughton Station would require acquisition of 7.44 acres of privately owned land. Three parcels would be obtained in entirety; 10 percent or less of three other parcels would be acquired. Two of these parcels may be eliminated as the project is further refined (Table 4.4-12 and Figure 4.4-13). No residential or community facility displacements would result from these acquisitions. Acquired parcels would be commercial and industrial in nature and have the potential to displace businesses.

Employees may be residents of the surrounding environmental justice neighborhoods. Job losses from these businesses would be expected and could adversely impact the surrounding environmental justice neighborhood. Adverse impacts to affected businesses may be offset should they be relocated within close proximity to their existing site. All acquisitions would be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act).

Table 4.4-12 Stoughton Station: Environmental Justice Property Acquisition

Municipality	Parcel Number	Ownership	Generalized Zoning	General Land Use	Environmental Justice Categories	Area (acres)
Stoughton	053-101	Private	Industrial	Industrial	Foreign-Born	1.05
Stoughton	053-102	Private	Industrial	Commercial	Foreign-Born	4.42
Stoughton	054-110	Private	Commercial	Commercial	Foreign-Born	0.04
Stoughton	054-401	Private	Commercial	Commercial (vacant)	Foreign-Born	0.01
Stoughton	054-406	Private	Industrial	Industrial	Foreign-Born	1.90
Stoughton	054-407	Private	Industrial	Undeveloped (residential)	Foreign-Born	0.02
	TOTAL					7.44

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various)
Shading denotes parcel takings that may be reduced or eliminated in final design.

Whale's Tooth—Portions of five parcels within an environmental justice neighborhood would be acquired for the Whale's Tooth Station, as listed in Table 4.4-13 and shown Figure 4.4-14.

Table 4.4-13 Whale's Tooth Station: Environmental Justice Property Acquisition

Municipality	Parcel Number	Ownership	Generalized Zoning	General Land Use	Environmental Justice Categories	Area (acres)
New Bedford	66-101	Public	Industrial	Industrial	Income, Minority	1.92
New Bedford	66-121[1]	Public	Industrial	Industrial	Income, Minority	0.38
New Bedford	66-133	Public	Industrial	Industrial	Income, Minority	3.38
New Bedford	66-133A	Private	Industrial	Industrial	Income, Minority	0.05
New Bedford	66-157	Public	Industrial	Industrial	Income, Minority	0.26
Total						5.99

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).
1 This parcel would be acquired for the train station (all rail alternatives).

Four of the parcels that would be acquired for the Whale's Tooth Station are publicly owned and one is privately owned. All are zoned for industrial purposes and the general land use is industrial and they are all currently used for transportation/utilities. None are used for residential purposes. MassDOT may lease, rather than acquire, publicly owned parcels from the City of New Bedford. All of the land would be used as a parking lot for the station. There would be no impacts to environmental justice populations because no residences or jobs would be lost.

Fall River Depot—Portions of four parcels within an environmental justice neighborhood would be acquired for the Fall River Depot Station, as listed in Table 4.4-14 and shown Figure 4.4-15. Another five parcels outside of the designated environmental justice neighborhood would also be acquired. All acquired parcels are privately owned and used for commercial or industrial purposes. Businesses that may need to be acquired include a flooring store (Jay Vee's Discount Flooring), electrical companies (GEMCO electrical contractors and Cotter Electrical), tire service shop (Jimmy's Used Tires), and automobile detail service (Auto Accent). Acquisition of these nine parcels would result in a property tax revenue loss of $40,411 for the City of Fall River or approximately 0.0006 percent of real estate tax revenues collected in fiscal year 2011.

No readily available information suggests that these businesses are owned by environmental justice populations. Employees may be residents of the surrounding environmental justice neighborhoods. Job losses from these businesses would be expected and could adversely impact the surrounding environmental justice neighborhood. Adverse impacts to affected businesses may be offset should they be relocated within close proximity to their existing site. All acquisitions would be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act).

Table 4.4-14 Fall River Depot Station: Environmental Justice Property Acquisition

Municipality	Parcel Number	Ownership	Generalized Zoning	General Land Use	Environmental Justice Categories	Area (acres)
Fall River	O-22-5	Private	Industrial	Commercial	Income, Minority	0.12
Fall River	O-22-6	Private	Industrial	Commercial	Income, Minority	0.10
Fall River	O-22-7	Private	Industrial	Commercial	Income, Minority	0.12
Fall River	O-22-11	Private	Industrial	Industrial	Income, Minority	0.47
Total						0.81

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

Battleship Cove Station—A portion of one parcel within an environmental justice neighborhood would be acquired for the Battleship Cove Station, as listed in Table 4.4-15 and shown in Figure 4.4-16.

Table 4.4-15 Battleship Cove Station: Environmental Justice Property Acquisition

Municipality	Parcel Number	Ownership	Generalized Zoning	General Land Use	Environmental Justice Categories	Area (acres)
Fall River	Y-1-3	Public	Industrial	Undeveloped	Income	0.08

Source: MassGIS 2002, 2005; municipal data 2009, aerial mapping, and online research (various).

The portion of the parcel that would be acquired for the Battleship Cove Station is owned by the City of Fall River and is part of the Ponta Delgada plaza. The land would be used for accessing the station platform. MassDOT may negotiate a lease arrangement with, rather than acquire from, the City for this parcel. There would be no impacts to the environmental justice population. No privately owned environmental justice neighborhood land would be acquired for constructing the Battleship Cove Station.

Layover Facilities

No parcels within an environmental justice neighborhood would be acquired for the Weaver's Cove East site layover facility. One parcel owned by the City of New Bedford would be affected by the Wamsutta site layover facility, but no privately owned environmental justice neighborhood land would be acquired (Figure 4.4-17). There would be no impacts to environmental justice populations due to property acquisitions from the layover facility sites because no residences or jobs would be lost.

Mitigation

In accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act), MassDOT would work with affected property owners to identify possible relocation sites. The same protocols would be followed for all property owners, regardless of designation. MassDOT will not mitigate other financial impacts or indirect displacement effects to environmental justice

neighborhoods that may result from property acquisition. Increased transit options and economic activity that may be induced by the South Coast Rail project has the potential to provide new employment opportunities for affected business owners and designated environmental justice populations in the area.

4.4.3.3 Socioeconomics

This section addresses neighborhood fragmentation and indirect socioeconomic effects related to transit-oriented development in the vicinity of stations.

Neighborhood Fragmentation

Southern Triangle (Common to All Rail Alternatives)

The Fall River Secondary and New Bedford Main Line segments are active freight railroads. Fragmentation of environmental justice neighborhoods, or any other neighborhoods, would not result from adding commuter rail service to the Fall River Secondary or New Bedford Main Line.

Stoughton Alternatives

The Stoughton Line between Canton and Stoughton is used as an active commuter railroad. Fragmentation of environmental justice neighborhoods, or any other neighborhoods, along this segment would not result from adding commuter rail service to the Stoughton Line.

South of the Stoughton Station, informal and unauthorized residential and recreational use of the railroad bed in several communities has established neighborhood continuity where none may have existed during the active phase of the railroad. Some neighborhood fragmentation may result in the segment between Stoughton Station and Weir Junction, but would not impact the environmental justice neighborhoods in Taunton. As described in Chapter 4.2, *Land Use*, the Stoughton Line in Taunton is adjacent to or passes through commercial, industrial, and residential development. The alignment crosses most residential neighborhoods perpendicular to main thoroughfares. Although temporary delays in traffic patterns may occur at road/railroad crossings, it is unlikely that the presence of the railroad in this segment would fragment the neighborhoods or disrupt continuity. Fragmentation of environmental justice neighborhoods would be negligible.

Whittenton Alternatives

The potential for neighborhood fragmentation under the Whittenton Alternatives along segments shared with the Stoughton Alternatives and along the Attleboro Secondary is negligible. Environmental justice neighborhoods are not located along the Whittenton Branch.

Indirect Effects of Transit-Oriented Development

As described in the *South Coast Rail Economic Development and Land Use Corridor Plan,*[14] transit-oriented development (TOD) in the vicinity of train stations would provide benefits to environmental justice populations. TOD emphasizes "compact, generally mixed-use development at or near transit

[14] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy, Inc.: Boston.

stops whose design encourages walking and transit use." Environmental justice populations generally have less access to automobiles than the statewide average; improved access to transit and jobs resulting from TOD would benefit these populations.

Environmental justice populations may also benefit from increased property values in the vicinity of station sites, and TOD could further amplify that effect. Conversely, property values may decrease along the alignments, due to negative impacts of increased noise from train operations. Near station sites there may also be a "gentrification" effect, a process whereby neighborhood revitalization or investment is accompanied by the influx of higher-income populations that displace lower-income residents in a community. Environmental justice populations (specifically, those defined as low income) are displaced from homes or apartments if property becomes unaffordable. The effects of gentrification may vary among property owners and renters. While owners may benefit from increased property values, renters may experience unaffordable rental increases. As described in the Corridor Plan, TOD may offset this effect if affordable housing is a required component.[15] Further discussion of potential property value impacts and a review of the relevant literatures is provided in Chapter 4.3, *Socioeconomics*. Overall, impacts to environmental justice populations due to property value changes are possible, but are too uncertain to predict precisely. Numerous factors other than transit contribute to changes in housing prices, such as the state of the national and regional economy, changes in income, inflation, tax policy and many other factors.

Because the impact is speculative and the mitigation measures are beyond the authority of USACE or MassDOT to implement, no mitigation for displacement/gentrification impacts is proposed. State and local programs that provide assistance to renters and home buyers at least partially offset impacts. Such programs include Section 8 housing programs, HomeBASE, Massachusetts Rental Vouchers, and the Alternative Housing Voucher Program, among others, as well as project based voucher plans like the Neighborhood Rental Initiative.[16] Additional tools are available to municipalities to minimize impacts of new transit service, such as programs to preserve affordable rental housing. Municipalities with stations in designated environmental Justice neighborhoods are Canton, Fall River, New Bedford, and Stoughton. A range of planning tools to address the potential adverse effects of establishing transit service in traditionally underserved communities, focusing on local agencies coordinating with state or regional agencies, is provided in *Maintaining Diversity in America's Transit-Rich Neighborhoods: Tools for Equitable Neighborhood Change* (Pollack et al, 2010). It would be the municipalities' responsibility to select and implement the appropriate tools.

Section 4.4.3.7 describes anticipated improvements in access to jobs, schools, and hospitals that would be experienced by communities—both designated and non-designated environmental justice neighborhoods—across the South Coast Rail corridor. It is anticipated that increased access to these services would help offset or mitigate minor and localized adverse impacts that may result from the South Coast Rail project.

Station-Level Indirect Effects

The following sections provide an overview of potential indirect socioeconomic changes in the vicinity of stations in environmental justice neighborhoods.

[15] Ibid.

[16] Commonwealth of Massachusetts. Executive Office of Housing and Economic Development. *Rental Assistance Management*. http://www.mass.gov/hed/housing/rental-assistance/.

Stoughton Station

While the relocated Stoughton Station would be sited within immediate proximity to the existing station, increased ridership along the line and the availability of new developable land near the station may encourage additional development in the area. While it is difficult to predict with any certainty how the introduction of the proposed station would affect the community, including environmental justice populations in the area (Figure 4.4-13), it is anticipated that because the area is already served by transit options that the relocation of the station would not induce development that would disproportionately and adversely affect environmental justice populations. Investment in and incentives for the area would be dependent on municipal goals, which may support smart growth and TOD that would help contain sprawl and support mixed-use development. Increased ridership would support new development in the area and would likely offer employment opportunities for environmental justice populations in the area. Because the proposed station site is located along an existing rail line, it is not anticipated that the South Coast Rail project would adversely affect community cohesion or fragment neighborhoods, including those in designated environmental justice neighborhoods.

King's Highway

The King's Highway Station site would not require development of an undeveloped area and has adequate infrastructure to serve the station and support nearby redevelopment. The site is near employment opportunities and environmental justice neighborhoods (Figure 4.4-5). The station could also help spur redevelopment on a nearby site currently occupied by an aging shopping plaza. The site presents an opportunity for joint development. This redevelopment opportunity could induce growth in nearby environmental justice neighborhoods.

Property values in environmental justice neighborhoods surrounding the King's Highway Station site may increase due to a perceived market value of residences or businesses close to a transit center. Additionally, TOD in the vicinity of the site could further enhance property values. Because of the undeveloped nature of the proposed station site and the availability of adjacent land, the introduction of the proposed station through redevelopment opportunities would likely introduce a certain amount of economic activity that may not otherwise occur. Such development, if properly planned, would help support community cohesion and would not fragment neighborhoods.

In New Bedford, 68.2 percent of the population is defined as living in environmental justice neighborhoods. The site is near (within 0.5 mile of) one neighborhood meeting environmental justice income criteria. Approximately 20.9 percent of the population (1,213 persons) within 0.5 mile of the King's Highway Station site resides in a designated environmental justice neighborhood. Neighborhoods meeting a full range of environmental justice criteria are outside of the 0.5-mile radius around the King's Highway Station site.

Approximately 21.7 percent of the households in New Bedford had no registered motor vehicles in 2000, compared to a statewide average of 12.7 percent. Based on these data, this portion of the New Bedford environmental justice populations in particular is likely to realize an improvement in local employment or access to transit services for employment and/or educational opportunities inside or outside the community.

Whale's Tooth

The Whale's Tooth Station site is located within and near environmental justice neighborhoods in New Bedford (Figure 4.4-6). This station may also serve environmental justice populations in nearby Fairhaven and Dartmouth.

The Whale's Tooth Station site would not require development in an undeveloped area and has adequate infrastructure to serve the station and support nearby redevelopment. The site is close to the New Bedford waterfront, downtown New Bedford, and the Hicks Logan redevelopment area. The station would be near employment opportunities and environmental justice populations. Immediately adjacent to the site are old mill buildings in the process of being converted to homes. The station could be used as a catalyst for TOD. The Hicks Logan area presents an opportunity to develop a mixed-use waterfront neighborhood that would be served by rail. This redevelopment opportunity could spur growth in nearby environmental justice neighborhoods.

Property values in environmental justice neighborhoods surrounding the Whale's Tooth Station site may increase due to a perceived market value of residences or businesses close to a transit center. Additionally, TOD in the vicinity of the site could further enhance property values. Because the proposed station site is located along an existing rail line, it is not anticipated that the South Coast Rail project would adversely affect community cohesion or fragment neighborhoods, including those in designated environmental justice neighborhoods. Such development, if properly planned, would help support community cohesion and would not fragment neighborhoods.

Statistical information suggests that environmental justice populations may benefit from the Whale's Tooth Station. In New Bedford, 68.2 percent of the population is defined as living in environmental justice neighborhoods. The site is within a neighborhood meeting environmental justice income and minority criteria, and is close to (within 0.5 mile of) other neighborhoods meeting foreign-born, minority, and/or income criteria. Approximately 85.6 percent of the population (8,937 persons) within 0.5 mile of the Whale's Tooth Station site resides in a designated environmental justice neighborhood.

Approximately 21.7 percent of the households in New Bedford had no registered motor vehicles in 2000, compared to a statewide average of 12.7 percent. Based on these data, this portion of the environmental justice population in New Bedford, in particular, may benefit from increased business activity in the area as well as transit services that would provide access to employment and/or educational opportunities outside the community.

The Whale's Tooth Station site is approximately 2 miles from downtown Fairhaven, where 9.7 percent of the population is defined as living in environmental justice neighborhoods (low income). It is approximately 4 miles from downtown Dartmouth, where 11.8 percent of the population is defined as living in environmental justice neighborhoods (foreign-born and/or income criteria). The data suggests that the environmental justice population in Fairhaven and Dartmouth, in particular, is likely to realize an improvement in access to transit services for employment and/or educational opportunities outside the community. Induced development around the proposed station may also provide new employment opportunities.

Fall River Depot

The Fall River Depot Station site is partially within and would therefore serve an environmental justice neighborhood in Fall River (Figure 4.4-8), and would also serve environmental justice populations in

nearby Swansea. The adjacent neighborhood meets environmental justice minority and low income criteria. The following subsections describe the direct and indirect impacts to environmental justice populations in Fall River and Swansea potentially resulting from constructing and using the Fall River Station along the Fall River Secondary.

The Fall River Depot Station site is located 1 mile north of downtown Fall River. It is within close proximity to a dense residential neighborhood and aging shopping plaza and across from the waterfront on Route 79, which is currently experiencing redevelopment. This site is close to employment opportunities and environmental justice neighborhoods. Through enhanced transit options, the station could help support redevelopment goals for the waterfront. Initiatives and incentives that are beyond the scope of this project would need to be implemented to ensure that all populations, including state-listed environmental justice populations, experience the benefits on increased transit and economic activity in the area that may be induced because of the South Coast Rail project. Such development, if properly planned, would help support community cohesion and would not fragment neighborhoods.

Statistical information suggests that the Fall River environmental justice populations may benefit from access to transit services at the Fall River Depot Station. As noted above, 57.3 percent of the Fall River population is defined as living in environmental justice neighborhoods. The site is close to (within 0.5 mile of) neighborhoods meeting environmental justice income and/or minority criteria. Approximately 50.2 percent of the population (4,652 persons) within 0.5 mile of the Fall River Station site resides in a designated environmental justice neighborhood. Neighborhoods meeting a full range of environmental justice criteria are near the Fall River Station site.

Approximately 20.7 percent of the households in Fall River had no registered motor vehicles in 2000, notably higher than the statewide average of 12.7 percent. Based on these data, this portion of the environmental justice population in Fall River is likely to realize an improvement in local employment and access to transit services to employment and/or educational opportunities both inside and outside the community. Induced development around the proposed station may also provide new employment opportunities.

The Fall River Depot Station site is approximately 4 miles from downtown Swansea, where 5.7 percent of the population is defined as living in environmental justice neighborhood (low income). Improved transit access to employment centers may provide new opportunities for environmental justice populations in Swansea. Induced development around the proposed station may also provide new employment opportunities.

Battleship Cove

The Battleship Cove Station site is in and near environmental justice neighborhoods in Fall River (Figure 4.4-9). The surrounding neighborhood meets low income criteria; nearby neighborhoods meet foreign-born, minority, income, and/or limited English proficiency criteria. The following subsections describe the direct and indirect impacts to the Fall River environmental justice populations potentially resulting from the construction and operation of the Battleship Cove Station along the Fall River Secondary Rail Segment.

The Battleship Cove Station site would be located on the Fall River waterfront, close to downtown, near the Fall River Heritage Park and other tourist attractions. The site is close to employment opportunities and environmental justice populations. Although the site is too small for redevelopment to occur right at

the station, the station could spur redevelopment in the waterfront area, a place with old manufacturing buildings and vacant land that the city would like to redevelop.

Property values in environmental justice neighborhoods surrounding the Battleship Cove Station site may increase due to a perceived market value of residences or businesses close to a transit center. Additionally, TOD in the vicinity of the site could further enhance property values. Through enhanced transit options, the station could help support redevelopment goals for the waterfront. Initiatives and incentives that are beyond the scope of this project would need to be implemented to ensure that all populations, including state-listed environmental justice populations, experience the benefits on increased transit and economic activity in the area that may be induced because of the South Coast Rail project. Such development, if properly planned, would help support community cohesion and would not fragment neighborhoods.

Statistical information suggests that the Fall River environmental justice populations may benefit from the Battleship Cove Station. In Fall River, 57.3 percent of the population is defined as living in environmental justice neighborhoods. The Battleship Cove Station site is within a neighborhood meeting environmental justice income criteria, and is close to (within 0.5 mile of) other neighborhoods meeting foreign-born, minority, income, and/or English language fluency criteria. Approximately 88.7 percent of the Fall River population (10,965 persons) within 0.5 mile of the Battleship Cove Station site resides in a designated environmental justice neighborhood.

Neighborhoods meeting a full range of environmental justice criteria are present outside of the 0.5-mile radius around the Battleship Cove Station site. Approximately 20.7 percent of the households in Fall River had no registered motor vehicles in 2000, compared to a statewide average of 12.7 percent. Based on these data, this portion of the environmental justice populations in Fall River may realize an improvement in local employment and/or educational opportunities both inside and outside the community due to improved options for transit access. However, the populations' choice to utilize the rail service is subject to individual factors, such as the commuter cost of the new rail service, as well as the income and availability of job opportunities inside and outside the community. Further discussion of potential local economic impacts and a review of the relevant literatures is provided in Chapter 4.3, *Socioeconomics*.

Taunton Depot

The Taunton Depot Station site is not within an environmental justice neighborhood (Figure 4.4-1a), but environmental justice neighborhoods are present in nearby Taunton.

The Taunton Depot Station site has adequate infrastructure to serve the station and support redevelopment. It is located close to employment opportunities and services as well as multi-family housing. The station would be near a key highway junction for Freetown, Berkley, and Lakeville. The use of this site could be a catalyst for TOD in that it offers an opportunity in the future to redevelop the existing shopping center into a mixed-use neighborhood or lifestyle center. The distance of this site from environmental justice neighborhoods limits the potential growth-inducing effects that this station may have on those neighborhoods. However, increased economic activity in the station area as a result of the proposed station and redevelopment initiatives may offer new employment opportunities for environmental justice populations.

As noted above, no environmental justice neighborhoods are present within 0.5 mile of the Taunton Depot Station site. Statistical information suggests that the Taunton environmental justice population

may benefit from access to transit services at the Taunton Depot Station. The site is approximately 2.25 miles from downtown Taunton, where 12.7 percent of the population is defined as living in environmental justice neighborhoods. These neighborhoods are identified as meeting minority and/or income environmental justice criteria.

Only 9.3 percent of the households in Taunton had no registered motor vehicles in 2000, compared to a statewide average of 12.7 percent. Based on these data, this portion of the environmental justice population in Taunton in particular is likely to realize an improvement in local employment and access to transit services for employment and/or educational opportunities outside the community.

Canton Center

The Canton Center Station is in an environmental justice neighborhood in Canton (Figure 4.4-3a). The neighborhood meets environmental justice minority criteria. Given the current active status of the Canton Center Station in a developed area of Canton, it is unlikely that direct or indirect effects to environmental justice populations would result from using this station.

Taunton (Dean Street) Station – Stoughton Alternatives

The Taunton Station site is located near, but not within, an environmental justice neighborhood in Taunton (Figure 4.4-3e). The nearby environmental justice neighborhood meets low income criteria.

The Taunton (Dean Street) Station site would not require development in an undeveloped area and has adequate infrastructure to serve the station and support nearby redevelopment. The site is near downtown Taunton, close to employment opportunities and near environmental justice neighborhoods. Enhanced transit options may help support redevelopment efforts. Initiatives and incentives that are beyond the scope of this project would need to be implemented to ensure that all populations, including state-listed environmental justice populations, experience the benefits on increased transit and economic activity in the area that may be induced because of the South Coast Rail project. Such development, if properly planned, would help support community cohesion and would not fragment neighborhoods.

Dana Street – Whittenton Alternatives

The Dana Street Station is not located in an environmental justice neighborhood, but a designated environmental justice area for the income and minority criteria is located adjacent to the site and several other environmental justice areas are designated in nearby downtown Taunton (Figure 4.4-4).

The station could also catalyze TOD and presents an opportunity to spur economic growth in Taunton. This redevelopment opportunity could spur growth in the surrounding environmental justice neighborhoods.

Property values in environmental justice neighborhoods surrounding the Dana Street Station site may increase due to a perceived market value of residences or businesses close to a transit center. Additionally, TOD in the vicinity of the site could further enhance property values.

Statistical information suggests that environmental justice populations may benefit from the Dana Street Station. Approximately 27.7 percent of the population (411 persons) within 0.5 mile of the Dana

Street Station site resides in a designated environmental justice area. Approximately 21.1 percent of the population of Taunton is defined as living in environmental justice areas.

Only 9.3 percent of the households in Taunton had no registered motor vehicles in 2000, compared to a statewide average of 12.7 percent. Based on these data, the this portion of the environmental justice population in Taunton in particular is likely realize an improvement in local employment and access to transit services for employment and/or educational opportunities both inside and outside the community.

4.4.3.4 Noise

Stoughton Alternatives

The Stoughton Alternatives pass through or near residential environmental justice neighborhoods in Stoughton, Taunton, New Bedford, and Fall River. These environmental justice neighborhoods would experience similar impacts under both the Stoughton Electric and Diesel Build Alternatives.

Noise impacts from the Stoughton Electric Alternative to environmental justice and non-environmental justice neighborhoods in communities through which it passes are listed in Table 4.4-16 and shown in Figures 4.4-18a-d, 4.4-19, and 4.4-20a-d.

Table 4.4-16 Stoughton Electric Alternative: Summary of Noise Impacts[1]

	Affected Residences within Environmental Justice Neighborhoods	Affected Residences within Non-Environmental Justice Neighborhoods	Total Affected Residences	Percent of Affected Residences within Environmental Justice Neighborhoods
Stoughton	7	98	105	6.7
Easton	0	322	322	0.0
Raynham	0	86	86	0.0
Taunton	21	72	93	22.6
Berkley	0	55	55	0.0
Lakeville	0	35	35	0.0
Freetown	0	99	99	0.0
New Bedford	41	114	155	26.5
Fall River	292	204	496	58.9
TOTAL	361	1,085	1,446	25.0

1 Values based upon a combination of train operational noise and horn use at crossings.

The noise analysis concluded that the electric train alternative along the Stoughton line would result in noise impacts (combined moderate and severe) to 1,446 residences. The number of impacted environmental justice neighborhood residences (361) is 25.0 percent of the total, while the number of noise-impacted non-environmental justice neighborhood residences (1,085) is 75.0 percent of the total.

Whittenton Alternatives

Noise impacts from the Whittenton Electric Alternative to environmental justice and non-environmental justice neighborhoods in communities through which it passes are listed in Table 4.4-17. These

environmental justice neighborhoods would experience similar impacts under both the Whittenton Electric and Diesel Build Alternatives.

Table 4.4-17 Whittenton Electric Alternative: Summary of Noise Impacts[1]

	Affected Residences within Environmental Justice Neighborhoods	Affected Residences within Non-Environmental Justice Neighborhoods	Total Affected Residences	Percent of Affected Residences within Environmental Justice Neighborhoods
Berkley	0	55	55	0.0
Easton	0	322	322	0.0
Fall River	292	204	496	58.9
Freetown	0	99	99	0.0
Lakeville	0	35	35	0.0
New Bedford	41	114	155	26.5
Raynham	0	86	86	0.0
Stoughton	7	98	105	6.7
Taunton	502	932	1,434	35.0
TOTAL	**842**	**1,945**	**2,787**	**30.2**

1 Values based upon a combination of train operational noise and horn use at crossings.

The noise analysis concluded that the Whittenton Electric Alternative trains would result in noise impacts (combined moderate and severe) to 2,787 residences. The number of impacted environmental justice neighborhood residences (842) is 30.2 percent of the total, while the number of noise-impacted non-environmental justice neighborhood residences (1,945) is 69.8 percent of the total.

Fall River

The Fall River Secondary, common to all rail alternatives, passes through or near state-listed environmental justice neighborhoods in Fall River. The current sound environment along this segment of the Fall River Secondary includes the active freight use of the railroad, heavy traffic on several major highways (Routes 6, 79, and 138, and I-195), and industrial and commercial activities. Noise impacts from the Fall River Secondary Rail Segment that would be experienced by both designated and non-designated environmental justice communities through which the railroad passes are shown in Figures 4.4-18a-d. In Fall River, environmental justice neighborhood residences impacted by noise would account for 58.9 percent of the total number of impacted residences by the Stoughton Electric Alternative; likewise, 58.9 percent of the total number of residences impacted by the Whittenton Electric Alternative would be environmental justice neighborhood residences.

New Bedford

The New Bedford Main Line Rail Segment, also common to all alternatives, passes through or near residential environmental justice neighborhoods in New Bedford. Noise impacts from the New Bedford Main Line to environmental justice and non-environmental justice neighborhoods in communities through which the railroad passes are shown in Figure 4.4-19. In New Bedford, environmental justice neighborhood residences impacted by noise from the Stoughton Electric Alternative would account for 26.5 of all impacted residences; likewise, the Whittenton Electric Alternative would impact 26.5 environmental justice neighborhood residences of all impacted residences.

Taunton

The current sound environment along the Taunton segment of the alignment includes the active freight use of the New Bedford Main Line and Attleboro Secondary through Weir Junction, heavy traffic on one major highway (Route 138), and industrial and commercial activities. In Taunton, environmental justice neighborhood residences that would experience noise impacts from the Stoughton Electric Alternative would account for 22.6 percent of the total number of impacted residences; 35.0 percent of total residences impacted by the Whittenton Electric Alternative would be environmental justice neighborhood residences.

Stoughton

The current sound environment in Stoughton includes the active commuter rail use of the Stoughton Line, and industrial and commercial activities. In Stoughton, environmental justice neighborhood residences impacted by noise would account for 16.7 percent of the total number of impacted residences by the Stoughton Electric Alternative; 6.7 percent of the total number of residences impacted by the Whittenton Electric Alternative would be environmental justice neighborhood residences.

Berkley, Easton, Freetown, Lakeville and Raynham

There are no environmental justice neighborhoods (as defined by the criteria cited in Section 4.4.1) along the Stoughton or Whittenton Electric Alternative in Berkley, Easton, Freetown, Lakeville, or Raynham; accordingly, there are no noise impacts to environmental justice neighborhoods in these communities.

Mitigation

Noise mitigation policy and process are described in detail in Chapter 4.6, *Noise*. In general, reasonable mitigation would be incorporated to address severe impacts. In areas where noise barriers are not cost-effective, alternative mitigation such as building sound insulation would be used. Two severely impacted sensitive receptor areas within designated environmental justice neighborhoods that meet MBTA's policy for a noise barrier:

- Murray Street area from Brightman Street to Cory Street in Fall River; and
- Almy Street area from Cory Street to President Avenue in Fall River.

The implementation of the proposed noise barriers would mitigate severe impacts to 36 sensitive receptors in designated environmental justice neighborhoods. The southernmost extent of the barriers, the one-block segment from Brownell Street to President Avenue on both sides of the Fall River Secondary, is beyond the boundary of the designated environmental justice neighborhood.

For the remaining severely impacted sensitive receptor locations, building insulation is the most cost-effective noise mitigation for reducing the noise impacts associated with rail operations. Building insulation would mitigate severe impacts to 38 sensitive noise receptors in designated environmental justice neighborhoods. The implementation of this measure would occur in both designated and non-designated environmental justice neighborhoods.

In selecting mitigation measures to offset adverse impacts associated with increased noise levels in designated environmental justice communities, the affected property owners would be consulted and

permitted to identify preferred building noise mitigation measures for their property from a potential list of measures that would be provided by MBTA.

4.4.3.5 Vibration

The results of an updated vibration impact analysis for the Stoughton Alternatives is provided in Table 4.4-18. The table compares the vibration impacts prior to mitigation that would be experienced by environmental justice communities to those that would be experienced by non-environmental justice neighborhoods.

There would be approximately 50 more vibration impacts in environmental justice neighborhoods under the Whittenton Electric Alternative than the Stoughton Electric Alternative because of the impacts along the Attleboro Secondary through downtown Taunton. Vibration impacts under the Stoughton and Whittenton Diesel Alternatives would be the same as the corresponding electric alternative.

Table 4.4-18 Stoughton Alternatives Vibration Impacts

	Vibration Impacts to Residential Receptors		
Municipality	**Environmental Justice Neighborhoods**	**Non-Environmental Justice Neighborhoods**	**Total**
Stoughton	0	22	22
Easton	0	76	76
Raynham	0	34	34
Taunton	10	36	46
Berkley	0	20	20
Lakeville	0	7	7
Freetown	0	31	31
New Bedford	0	10	10
Fall River	76	47	123
Total	**86**	**283**	**369**

Table 4.4-18 shows that the combined total number of residences impacted by vibration from the Stoughton Alternative's trains prior to mitigation would be 369. Environmental justice neighborhoods contain only 23 percent of the impacted sensitive receptors, while non-environmental justice neighborhoods contain 77 percent of the impacted sensitive receptors. Based on these proportions, the Stoughton Alternatives would not result in disproportionate vibration impacts when considering the alignment as a whole. However, the potential for disproportionate vibration impacts exists at the local level in Fall River where 62 percent of impacts would occur in environmental justice communities.

For the Whittenton Alternatives, approximately 25 percent of the total vibration impacts (105 out of 417) would be borne by environmental justice communities (specifically in Taunton and Fall River). For the overall alignment, this would not result in disproportionate vibration impacts to environmental justice communities. However, as with the Stoughton Alternatives, the Whittenton Alternatives would have the potential for disproportionate adverse vibration impacts in Fall River. In addition, the Whittenton Alternatives would have the potential for disproportionate adverse vibration impacts to environmental justice areas in Taunton (along the Attleboro Secondary). With incorporation of mitigation measures, the majority of vibration impacts would be eliminated and no disproportionate adverse impacts would occur. Vibration impacts to environmental justice and non-environmental justice

neighborhoods would be mitigated under either the Stoughton or Whittenton Alternatives, as summarized below.

Several vibration mitigation measures were assumed to be incorporated in the project design, including:

- Continuously welded rail
- Ballast and sub-ballast would be placed to standard depths to reduce transmission of vibration to the ground
- Turnouts would be located at least 100 feet away from sensitive receptors
- Trains and track would be maintained to minimize vibration generated by the trains

Additional mitigation measures to be determined during final design would include ballast mats (rubber mats placed under the ballast). Ballast mats would be provided where vibration mitigation is justified and soil conditions are appropriate. A detailed evaluation of the source-receiver soil conditions would be required during final design to assess the effectiveness of the ballast mat at impacted receptor locations along the corridor. Ballast mats were considered cost effective to offset vibration impacts at the 39 locations shown on Figures 4.4-18a-d, 4.4-19 and 4.4-20a-d. Under the Stoughton Alternatives, mitigation measures for 55 impacted residential receptors would be within designated environmental justice neighborhoods in Taunton and Fall River. Table 4.4-19 lists the proposed location of ballast mats in environmental justice neighborhoods in Taunton and Fall River. It is anticipated that the implementation of appropriate mitigation measures would offset vibration impacts borne by both designated and non-designated environmental justice communities throughout the South Coast Rail corridor.

The same types of mitigation measures noted above for the Stoughton Alternatives could be used to mitigate the vibration impacts specific to the Attleboro Secondary in Taunton.

Table 4.4-19 Stoughton Alternatives, Proposed Ballast Mat Locations in Environmental Justice Neighborhoods

Municipality	Number of Receptors within Designated Environmental Justice Areas
Taunton	
High Street/Paul Bunker Drive	6
Ingell Street	2
Fall River	
Cory Street	27
Durfee Street/Cedar Street	20
Total	55

4.4.3.6 Public Safety

As discussed in Chapter 4.1, *Transportation*, there would not be any significant impact to public safety and therefore environmental justice neighborhoods would not be disproportionately impacted from an at-grade crossing and public safety perspective.

Outreach materials including those available from Operation Lifesaver – a nationwide, non-profit public information program that promotes highway-rail grade crossing safety – would be available in English, Spanish, Portuguese, French creole, and French, to ensure that all populations, including those with limited English proficiency are informed about the South Coast Rail project and possible safety risks.

4.4.3.7 Access and Travel Time Impacts

This section describes the impacts to access and travel time that would be realized by environmental justice populations as a result of the South Coast Rail project.[17] This includes evaluation of the improvements in access to employment centers, and colleges and hospitals, as well as improvements in travel time to Boston from Taunton, Fall River, and New Bedford for both environmental justice and non-environmental justice populations (Appendix 4.4-A).

Each travel scenario was compared to the No-Build Alternative (Enhanced Bus) on a percent change basis, and results are provided for both environmental justice and non-environmental justice neighborhoods.

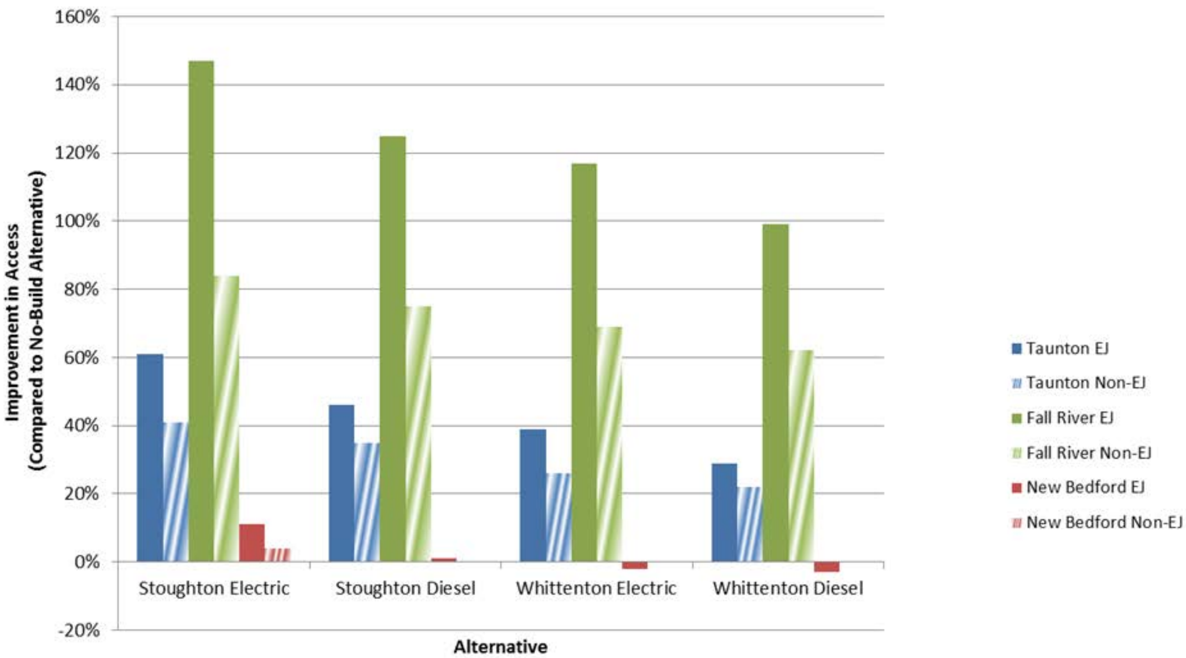
Potential Effects on Job Access

The South Coast Rail project would improve access to jobs for both environmental justice and non-environmental justice populations. The CTPS report identifies the relative improvements for each of the Build Alternatives as compared to the No-Build Alternative in transit access to employment opportunities from environmental justice and non-environmental justice neighborhoods in Taunton, Fall River, and New Bedford to jobs within 90 minutes' travel time.

Selected job access data are presented graphically in Figure 4.4-21. The relative improvement in access to basic jobs for environmental justice populations in the three communities is shown for each alternative as compared to the No-Build Alternative. The transit access percentages represent the change in the number of jobs that would be accessible within 90 minutes of these communities in reference to the No-Build Alternative. These values reflect a given population's change in the capacity to travel farther (to employment sites) within a 90-minute radius, as a result of changes in access to transit, from neighborhoods in each of the communities. Positive values represent improvements in access (more jobs accessible), while negative values represent degradations in access (fewer jobs accessible). Negative values are possible if a population (whether environmental justice or non-environmental justice) would realize less of a benefit by using a particular alternative than by using the Enhanced Bus system of the No-Build Alternative.

[17] CTPS. 2009. South Coast Rail Environmental Justice Study. Central Transportation Planning Staff, Boston Metropolitan Planning Organization: Boston.

Figure 4.4-21 Improvements in Job Access



These data suggest that, on average, access for environmental justice populations to basic jobs resulting from any of the South Coast Rail alternatives would be improved over the No-Build Alternative. The changes in access to basic jobs realized by environmental justice populations in the three communities vary considerably by alternative with the greatest improvements seen by Fall River populations using any of the alternatives. New Bedford populations would experience the least overall improvement. For New Bedford residents using the either of the Whittenton Alternatives, access to basic jobs would not be improved over the No-Build Alternative. The greatest average improvement would be accomplished by the Stoughton Electric Alternative where access to basic jobs for environmental justice populations in the three communities would improve by an average of 73 percent.

Potential Changes in Access to Colleges and Hospitals

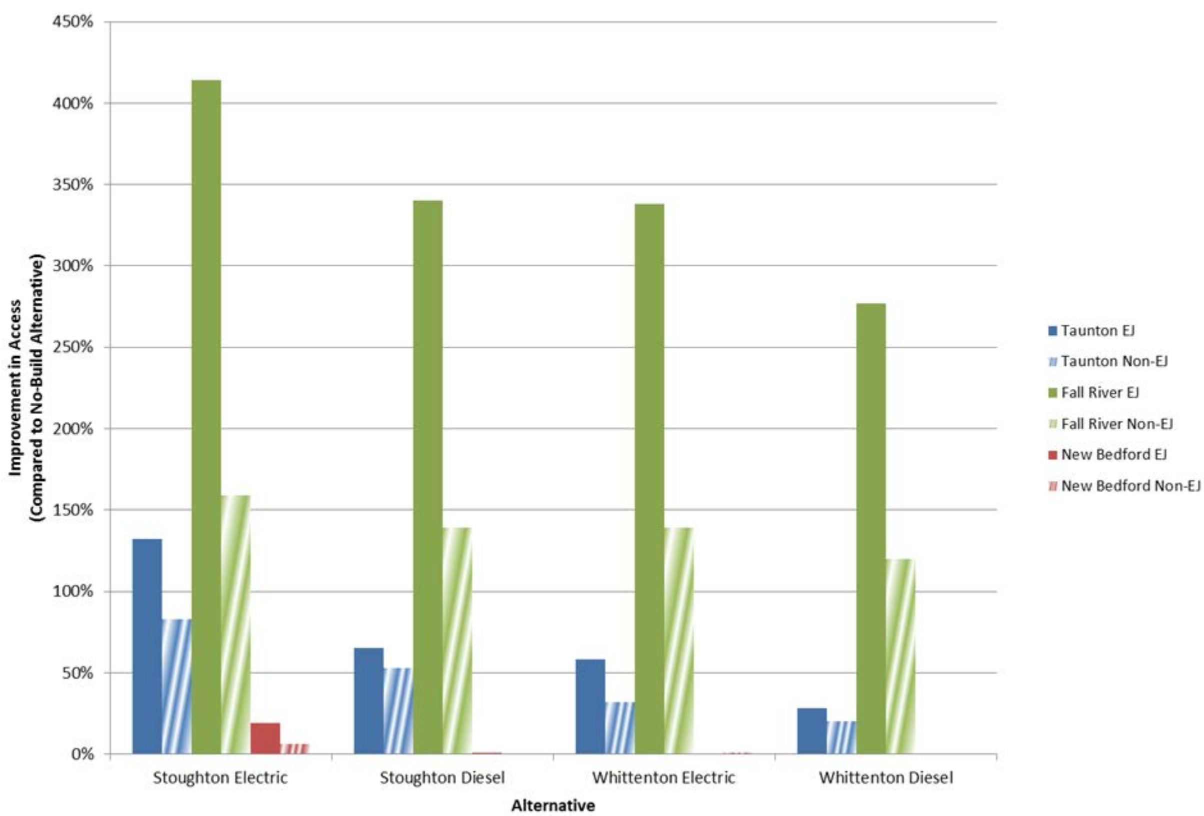
The South Coast Rail alternatives would result in improved access to colleges and hospitals for environmental justice and non-environmental justice populations. The CTPS report indicates that the project would improve transit access to higher education (i.e. commutation access to college enrollment slots) and non-emergency medical facilities (i.e. "hospital beds") for both environmental justice and non-environmental justice populations. The CTPS report identifies the relative improvements in transit access for each of the Build Alternatives as compared to the No-Build Alternative as reflected in the increase in the number of colleges and hospitals within 90 minutes' travel time by transit from environmental justice and non-environmental justice neighborhoods in Taunton, Fall River, and New Bedford.

Hospital access data are presented graphically in Figure 4.4-22. The relative improvement in access to hospitals for environmental justice populations in the three communities is shown for each alternative as compared to the No-Build Alternative. The transit access percentages represent the change in the number of medical facilities (as expressed in the total number of hospital beds) that are within the 90-

minute travel time radius. As with the access to basic jobs data described above, these values reflect a given population's change in the capacity to travel farther (to hospitals) within a 90-minute radius, as a result of changes in access to transit, from neighborhoods in each of the communities.

These data suggest that, on average, access for environmental justice populations to hospitals resulting from any of the South Coast Rail alternatives would be improved over the No-Build Alternative. The changes realized by environmental justice populations in the three communities vary considerably, again with the greatest improvements in access to hospitals seen by environmental justice populations in Fall River under any alternative. The least improvement would be seen by New Bedford populations using any alternative. CTPS attributes these minimal improvements to station locations (such as Whale's Tooth Station) that do not directly connect with existing Southeastern Regional Transit Authority bus terminals in New Bedford.

Figure 4.4-22 Improvements in Access to Hospitals



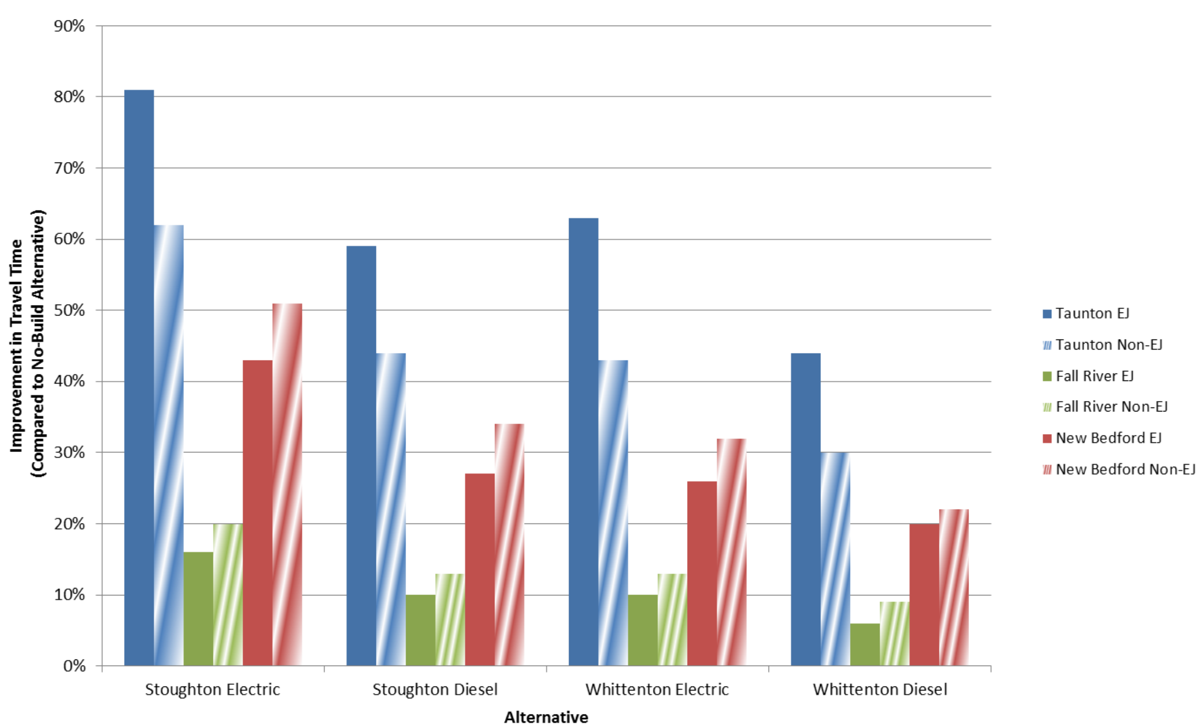
Potential Effects on In-Vehicle Travel Time to Boston

The South Coast Rail project would also result in improved as compared to the No-Build (Enhanced Bus) Alternative travel times to Boston from three South Coast communities for environmental justice and non-environmental justice populations. All alternatives would reduce in-vehicle travel times from the three communities to a selected location (South Station) in Boston for both environmental justice and non-environmental justice populations. Figure 4.4-23 graphically presents the relative improvements for each of the Build Alternatives as compared to the No-Build Alternative in travel time from environmental justice and non-environmental justice neighborhoods in Taunton, Fall River, and New Bedford to South Station.

These data suggest that, on average, travel times to Boston for environmental justice populations would decrease as compared to the No-Build Alternative as a result of any of the Build Alternatives proposed for the South Coast Rail project. The changes realized by environmental justice populations in the three communities vary moderately with environmental justice populations in Taunton experiencing the greatest benefit from all rail alternatives. Fall River populations (both environmental justice and non-environmental justice) would receive the least benefit from any of the Build Alternatives.

In some cases, the improvements for non-environmental justice populations are greater than for the environmental justice populations. This is a result of the relative locations of existing or proposed train stations in relationship to the environmental justice or non-environmental justice neighborhoods. None of the Build Alternatives would result in an increase of travel time from Taunton, Bedford or Fall River to Boston as compared to the No-Build Alternative for either environmental justice or non-environmental justice populations in these communities.

Figure 4.4-23 Improvements in Travel Time to Boston (South Station)



4.4.4 Summary of Impacts by Alternative

Table 4.4-20 summarizes potential adverse and beneficial effects to designated environmental justice communities that may result from the implementation of each alternative of the South Coast Rail project.

Table 4.4-20 Summary of Effects on Environmental Justice Populations

Effects	Stoughton Electric	Stoughton Diesel	Whittenton Electric	Whittenton Diesel
Adverse Effects				
Neighborhood Disruption/Fragmentation	None	None	None	None
Residential Displacements	None	None	None	None
Business/Job Displacements[1]	Minimal	Minimal	Minimal	Minimal
Noise Impacts in Environmental Justice Neighborhoods (number of residences impacted by moderate and severe increases in noise levels)[2]	361	361	842	842
Percent of Total Noise Impacts in Environmental Justice Neighborhoods	25%	25%	30%	30%
Vibration Impacts in Environmental Justice Neighborhoods (impacted sensitive receptors)[3]	86	86	105	105
Percent of Total Vibration Impacts in Environmental Justice Neighborhoods	23%	23%	25%	25%
Beneficial Effects (percent improvement compared to No-Build Alternative)				
Access to Jobs[4]				
Taunton	118	77	67	44
Fall River	187	151	140	113
New Bedford	21	4	-1	-2
Access to Colleges[5]	78	46	52	33
Access to Hospitals[6]	188	135	132	102
Travel Time to Boston[7]	47	32	33	23
Station Area TOD[8]	Yes	Yes	Yes	Yes

1 Business and job displacements would result from private property acquisition for the Fall River Depot Station, and would be minor as compared to the overall workforce in the surrounding community. See Chapter 4.2, *Land Use*, and Chapter 4.3, *Socioeconomics*.
2 Noise impacts data is based on the Stoughton and Whittenton Electric Alternatives; however the impacts of the diesel alternatives would be similar
3. Diesel and electric vibration impacts would be the same.
4. Provided as an average in improvement, as compared to the No-Build Alternative, in access to basic, service, and retail jobs within a 90-minute radius of each municipality. Source: CTPS 2009.
5 Provided as an average in improvement, as compared to the No-Build Alternative, in access from Taunton, Fall River, and New Bedford to colleges and hospitals. Source: CTPS 2009.
6 Provided as an average in improvement, as compared to the No-Build Alternative, in travel times from Taunton, Fall River, and New Bedford to Boston's South Station. Source: CTPS 2009.
7 Qualitative assessment of the potential for transit-oriented development in the vicinity of the station site that would benefit environmental justice populations. Source: Goody Clancy

Adverse effects to environmental justice populations that would result from the South Rail project are similar for all applicable resource topics with the exception of noise and vibration. Among the rail alternatives, the Whittenton Alternatives would impact the greatest number of residences, and the Stoughton Alternatives the least. Additionally, a greater percentage of noise impacts would be experienced by designated environmental justice populations under the Whittenton Alternatives than

the Stoughton Alternatives. Under all rail alternatives and on a regional level, adverse noise impacts would not be disproportionately borne by state-listed environmental justice communities. However, on the municipal level, the analysis concludes that state-listed environmental justice populations in Fall River would experience disproportionately high and adverse noise impacts as compared to non-environmental justice populations (prior to mitigation) under the Stoughton and Whittenton Alternatives.

Vibration impacts would be experienced across the region in both designated and non-designated environmental justice communities. Overall, adverse impacts would not be predominately borne by designated environmental justice communities under the Stoughton or Whittenton Alternatives. At the local level, designated environmental justice communities would experience a disproportionately high share of vibration impacts in Fall River under both the Stoughton and Whittenton Alternatives. Environmental justice communities in Taunton would experience a disproportionately high share of vibration impacts under the Whittenton Alternatives. Identified mitigation measures would be able to offset these impacts.

There are also benefits associated with the rail alternatives that would be recognized by all populations regardless of designation. Increased access would reduce travel times to Boston and other employment centers. Average travel time savings from Fall River, Taunton, and New Bedford greatest under the Stoughton Electric Alternative, followed by the Whittenton Alternative which would improve travel times by 14 percent. The Stoughton Electric also represents the greatest travel time savings to colleges and hospitals. The Whittenton Diesel Alternative typically represents the least travel time savings of the rail alternatives.

The beneficial effects to environmental justice populations that would result from the South Coast Rail project vary considerably by alternative and community. Property values in environmental justice neighborhoods near stations may increase as a result of improved access to transit and subsequent TOD. If property values get too high, environmental justice populations may be priced out of their current locations. Conversely, property values in environmental justice neighborhoods along the alternative alignments may decrease as a result of increased noise from train operations.

4.4.5 Public Outreach

In October 2008, project fliers inviting participation in planning activities were sent to more than 80 churches and community centers in environmental justice neighborhoods in New Bedford, Fall River, and the surrounding areas. A bilingual flier (English and Portuguese or English and Spanish) was distributed which invited residents to participate in public meetings on potential sites and development opportunities for rail stations in the New Bedford area. To better accommodate non-English speaking populations, all meeting notices offered translation services at public meetings.

In July 2009, a large-scale mailing was issued of a brochure with general project information in English, Spanish and Portuguese. The Southeastern Regional Planning and Economic Development District (SRPEDD) was consulted to further widen the outreach to environmental justice communities, including many of the same churches and community centers from the earlier mailing, as well as commissions on disability, housing authorities, councils on aging and newspapers such as the Cape Verdean News and the Portuguese Times, based in New Bedford. In addition, brochures were sent to the 31 public libraries and town planners in the region. In total, brochures were mailed to 250 recipients.

Planning and economic development staff and elected officials (including mayors) in New Bedford, Fall River and Taunton (and all of the other South Coast communities which may host stations) were consulted to gather ideas on economic development, sustainability and smart growth related to the project. These leaders and SRPEDD work with environmental justice groups in the communities on a regular basis, facilitating coordination with the public outreach team. The direct approaches have been through the community workshops on stations (one each in Fall River and Taunton and two in New Bedford).

In addition, MassDOT's South Coast Rail website has been maintained and updates are made as necessary. The website provides access to technical reports, fact sheets, flyers, and project updates. Targeted outreach efforts would be undertaken prior to public meetings and other outreach activities. Meeting notices would continue to be provided in foreign languages (Portuguese and Spanish) and translation services at meetings and for technical documents would continue to be provided upon request. Project staff would continue to meet with churches, community groups, and other organizations to engage environmental justice populations in the decision-making process.

In selecting mitigation measures to offset adverse impacts associated with increased noise levels in designated environmental justice communities, affected property owners would be consulted.

4.5 VISUAL AND AESTHETIC RESOURCES

4.5.1 Introduction

This chapter describes the visual character and aesthetic resources within and adjacent to the South Coast Rail Alternatives and identifies the effects to visual and aesthetic resources that may result from implementing each of the proposed South Coast Rail alternatives (including railroad or highway alignments, train or bus stations, and layover facilities).

Section 4.5.1 provides general information relative to the visual and aesthetic resources and associated regulations. Section 4.5.2 identifies and describes the specific viewpoints where elements of the rail corridor are, or may be, visible by the public and where adverse or beneficial impacts could occur. Sections 4.5.3 and 4.5.4 identify any changes in the visual setting that could have adverse impacts on the visual and scenic resources of importance to residents. Section 4.5.5 presents mitigation measures to minimize the visual impact of the project alternatives, and Section 4.5.6 outlines the regulatory compliance requirements for visual and aesthetic resources.

The Secretary of the Executive Office of EEA[1] issued a Certificate on the ENF on April 3, 2009. No specific requirements for evaluation of visual and aesthetic resources are included in the Certificate.

The Secretary's Certificate on the DEIR, dated June 29, 2011, included the following requirements in regard to National Wild and Scenic River resources:

- "*Taunton Wild and Scenic River*. The FEIR should include an update on consultations with the National Park Service regarding the status of Taunton River as a National Wild and Scenic River, and to discuss issues relating to water quality impacts from construction and stormwater runoff, rail line crossings of the Taunton and its tributaries, impacts to natural and cultural landscape features, selection and siting of layover facilities, and construction of the Fall River Depot station."

4.5.1.1 Resource Definition

Visual and aesthetic resources are defined as the features or stimuli within the landscape and the values attached to those resources by the viewer upon which a visual experience is based. General visual elements of a rail line include:

- Crossing protection systems;
  - gates
  - pole mounted flashers
  - flashers on cantilevers
- Overhead railroad bridges crossing roads, water bodies or other natural features;
- At-grade road crossings (the rails);

[1] Formerly, the Executive Office of Environmental Affairs.

- Overhead catenary;
- Vegetation along right-of-way;
- Stations and/or platforms, parking and buildings; and
- Lighting at stations.

4.5.1.2 Regulatory Context

There are no state or federal regulations applicable to the evaluation of aesthetics and visual resources. The CEQ NEPA regulations do require that an EIS evaluate a proposed action's impact on "urban quality, historic and cultural resources, and the design of the built environment."[2]

4.5.1.3 Methodology

Views of potential project elements are observed and described from public viewpoints, based upon a pedestrian at street level. Existing viewpoints of project elements include:

- Views of each proposed station from the nearest public way;
- Views of proposed grade-separated crossings; and
- Views of the rail right-of-way from selected public viewpoints.

Viewpoints were selected based on an understanding of the proposed alternative alignments and station sites and the location's visibility from a public right-of-way. Field reconnaissance confirmed viewpoints and photographs were taken from each location. Each viewpoint is shown on a map, described in text, and documented with a photograph.

4.5.2 Existing Conditions

This section identifies and describes specific viewpoints where elements of the rail or highway corridor are, or may be, visible by the public and where adverse or beneficial impacts could occur. These viewpoints are identified and described below and depicted in Figures 4.5-1 through 4.5-29. Viewpoints are identified with a number that corresponds to the figures.[3]

4.5.2.1 Regional Context

The majority of the study area is an existing rail corridor or highway, some of which is inactive. As discussed in Chapter 4.2, *Land Use and Zoning*, these areas consist of a range of single-family and multi-family residences, and commercial, industrial and mixed-use buildings. The predominant land uses visible from the corridor are residential, natural resources (forest and other protected undeveloped land), and industrial or commercial centers of activity. The uses along the rail corridor vary depending on the location relative to urbanized centers.

[2] Council on Environmental Quality. 2009. Code of Federal Regulations (CFR), Title 40: Protection of the Environment, Part 1502-Environmental Impact Statement, Section 16(g) Environmental Consequences (40 CFR 1502.16(g)).

[3] The viewpoints, numbered to coincide with the alternatives discussion (Southern Triangle, the Stoughton Alternatives, and the Whittenton Alternatives), are described generally north to south, east to west. Stations are numbered as they occur along each alignment. Viewpoint numbers are nonconsecutive.

Natural visual resources around the Project Area consist mostly of the open space resources discussed in Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*, and Chapter 4.16, *Wetlands.* These natural resources include ACECs, conservation land, wetland systems, and areas of important biodiversity value such as Hockomock Swamp, Pine Swamp, Assonet Cedar Swamp, Acushnet Cedar Swamp, Fowl Meadow and Ponkapoag Bog, and Forge Pond. Open space within view of the proposed rail corridors also includes passive and active recreation facilities such as Turner Playground, North Park, Freetown-Fall River State Forest, Stoughton Memorial Conservation Land, Ricker Field, Memorial Park, and municipal fields.

4.5.2.2 Existing Conditions within the Study Corridor

Southern Triangle (Common to all Build Alternatives)

This section describes typical (or representative) views of the New Bedford Main Line or the Fall River Secondary corridors from public streets. The New Bedford Main Line and the Fall River Secondary corridors are existing and active rail lines carrying freight. Tracks are visible primarily from cross-streets, where the general elements of rail lines are visible. Along these rail corridors, the primarily visible elements are crossing gates and lights.

Right-of-Way from Malbone Street (No. 1)

The right-of-way and grade crossing of the New Bedford Main Line at Malbone Street in Lakeville is characterized by pole-mounted flashers on either side of the right-of-way (Figure 4.5-1). There are no crossing protection gates or cantilevered flashers.[4] At this viewpoint, Malbone Street is a narrow, two-lane roadway bordered by forest and low-density single-family residential land uses. The viewpoint was selected because of its location on a residential roadway and for the potential impacts of improving the grade crossing.

Right-of-Way from Samuel Barnet Boulevard (No. 2)

The right-of-way and grade crossing of the New Bedford Main Line at Samuel Barnet Boulevard in New Bedford is characterized by flashers on either side of the right-of-way and a gated access way along the right-of-way (Figure 4.5-2). The flashers are both pole-mounted and cantilevered over the roadway. Samuel Barnet Boulevard is a two-lane road with ample shoulders on either side and is forested at this viewpoint. The viewpoint was selected because of its location on a forested roadway and for the potential impacts of improving the grade crossing.

Grade Crossing from Tarkiln Hill Road and King's Highway (Nos. 3, 4, 5)

Shown from three viewpoints (Figure 4.5-3), the grade crossing of the New Bedford Main Line at Tarkiln Hill Road and King's Highway in New Bedford is characterized by dual-side grade crossing protection gates and pole-mounted flashers. Tarkiln Hill Road and King's Highway are each two-lane roads that create a three-way intersection at the rail right-of-way. Together these roadways serve as a high-traffic commercial corridor. This intersection is surrounded by retail land uses. These viewpoints were selected because of the high-traffic nature of this roadway and the anticipated need to upgrade this grade crossing.

[4] A cantilevered flasher is a component of the grade crossing protection system that is suspended from a pole over the roadway. Flasher refers to the warning lights for automobiles.

Right-of-Way from Beechwood Road (No. 9)

The grade crossing of the Fall River Secondary at Beechwood Road in Freetown is characterized by pole-mounted crossing protection signs on either side of the right-of-way (Figure 4.5-4). The crossing at Beechwood Road currently does not have crossing protection flashers or gates. The view of the rail corridor from Beechwood Road is a long view of forest with track down the center. Beechwood Road is a rural, two-lane roadway surrounded primarily by forest at this viewpoint. The viewpoint was selected because of its location on a residential roadway and for the potential impacts of improving the grade crossing.

Stoughton Alternatives

This section describes typical (or representative) views of the Stoughton Line corridor from public streets. The Stoughton Alternatives (Electric and Diesel) would use the existing Stoughton Branch from Canton Junction to Weir Junction in Taunton. Portions of the Stoughton Line are currently inactive railroad rights-of-way. Evidence of a right-of-way is visible in some locations, primarily at cross-streets and where the right-of-way has been converted to driveways or paths. General elements of rail lines are not visible.

View of Right-of-Way from Route 138 (No. 20)

The Stoughton Line right-of-way was observed from Morton Street facing north, near the intersection with Route 138 in Stoughton (Figure 4.5-5). The right-of-way runs parallel to Route 138, which is characterized by low-density commercial retail and service establishments. A residential neighborhood exists on the west side of the right-of-way. The inactive rail right-of-way is visible in the street as it crosses Morton Street but is completely overgrown as it proceeds through the vegetated area between Route 138 and Morton Street. As this is currently an inactive right-of-way, there are no grade-crossing elements. The grade crossing is visible from Morton Street, immediately adjacent residences, and Route 138. The right-of-way is not visible. This viewpoint was selected because of the clearing on the right-of-way that would be required to accommodate the Stoughton Alternatives, grade crossing upgrades and potential views of the right-of-way from grade crossings.

Right-of-Way and Driveway from Fish and Game Club (No. 22)

The Stoughton Line right-of-way was observed from the driveway of the Stoughton Fish and Game Club on Route 138/Washington Street in Stoughton, facing east (Figure 4.5-6). The right-of-way runs parallel to Route 138, which is characterized by low-density commercial retail and service establishments. The Club is a private use, accessed from a short driveway off Route 138. The proposed right-of-way would cross this driveway. In its current condition, the right-of-way is vegetated and difficult to discern. This driveway is visible from the Fish and Game Club and from Route 138 at the driveway, due to the higher elevation of the roadway. This viewpoint was selected because of the clearing on the right-of-way that would be required to accommodate the Stoughton Alternatives and because the right-of-way crosses a driveway.

Easton Village Overpass at Main Street (No. 25)

The Main Street overpass in Easton was observed from a second angle, facing west along Main Street in Easton Village (Figure 4.5-7). This viewpoint shows a grade-separated rail crossing that is barely perceptible. Main Street passes over the rail right-of-way as a level roadway, with few features that indicate the presence of an overpass. On either side of Main Street, chain link fence marks the limits of

the overpass beyond the sidewalk. The right-of-way is overgrown, which also hinders its visibility from Main Street. Adjacent to the overpass, Main Street contains neighborhood commercial land uses, specifically small businesses in older buildings as well as a more recent gas station. This viewpoint was selected because the proposed project may require upgrades to the overpass and would require clearing of the right-of-way visible from the overpass.

Easton Village Right-of-Way under Main Street (No. 25)

The Stoughton Line right-of-way was observed from within the right-of-way south of the Main Street overpass in Easton Village (Figure 4.5-7). As it enters Easton Village, from the south, the Stoughton Line right-of-way is set below grade and would cross under Main Street and rise to the proposed Easton Village Station north of the town center. The right-of-way, which is somewhat overgrown, is flanked by a stone retaining wall on the west and a vegetated embankment on the east. At this location, surrounding uses include older residential homes to the east and the parking lot for a professional building to the west. The bridge is constructed of concrete, supporting a two-lane roadway. This viewpoint was selected because of the required overpass upgrades for operation of this alternative and potentially required right-of-way clearing.

Grade Crossing from Foundry Street (Nos. 27, 28)

The grade crossing of the Stoughton Line at Foundry Street in Easton was observed facing northeast and southwest (Figure 4.5-8). Both viewpoints show a right-of-way. This right-of-way is difficult to discern as a potential rail corridor, due to overgrown forest that extends to the edge of the road. Looking southeast, the right-of-way is beyond the Foundry Street crossing of the Black Brook Conservation Area. Looking northeast, the right-of-way is in the forefront of the photograph and marked by boulders on the south side of Foundry Street (left of photo). There are no indications of a grade crossing at this viewpoint. This viewpoint was selected because there is no visual evidence of an existing rail right-of-way or grade crossing; grade crossing upgrades and clearing would be required for the proposed project.

Right-of-Way from Bridge Street (No. 30)

The Stoughton Line right-of-way was observed from Bridge Street in Raynham, facing north (Figure 4.5-9). As the name indicates, Bridge Street passes over the right-of-way. From Bridge Street, the inactive rail right-of-way is clearly visible; it is flanked by power lines and beginning to become overgrown by the adjacent forest (a portion of the Hockomock Swamp ACEC). The center portion of the inactive rail right-of-way in the foreground is partially covered with ice and inundated. Snow and ice are accumulated along the right-of-way. This viewpoint was selected because of the views from Bridge Street and the clearing required for the right-of-way upgrades.

Right-of-Way at Carver Street (No. 31)

The Stoughton Line right-of-way and grade crossing at Carver Street was observed from the right-of-way south of Carver Street facing north (Figure 4.5-10). The right-of-way at this viewpoint is marked by log posts and rocks; it is in active use as a dirt roadway on either side of Carver Street. As this is an inactive right-of-way, there are no grade-crossing elements. This section of Carver Street is residential, but the right-of-way is primarily flanked by forest. This right-of-way is clearer of vegetation than other viewpoints along this segment of the Stoughton Line, although no tracks exist. This viewpoint was selected because the Stoughton Alternatives would introduce a grade crossing at this location.

Grade Crossing near Post Office on Route 138 (Nos. 32, 33, 34)

The proposed grade separation of the Stoughton Line at Washington Street/ Route 138 in Raynham was observed at three viewpoints (Figure 4.5-11). This proposed grade separation occurs adjacent to the intersection of the Stoughton Line with the Whittenton Branch. Route 138 is a high-traffic, two-lane commercial corridor. The development occurring near this viewpoint is low-scale commercial service and sales uses, typical of an older commercial corridor. Along the corridor, commercial properties are interspersed with forest. Generally, businesses in this stretch of Route 138 occupy one- or two-story older wooden buildings, with parking at the street edge. Beyond the commercial uses, there is a residential neighborhood east of Route 138 and forest to the west. These viewpoints were selected because of the proposed grade separation that would be required for the Route 138 crossing.

Viewpoints No. 33 and 34 were observed looking north and south on Route 138, respectively, where the Stoughton Line right-of-way crosses Route 138. As this is an inactive right-of-way, there are currently no grade-crossing elements and the right-of-way is difficult to discern. West of Route 138, in the north-facing photograph, the right-of-way is present north of the commercial plaza. East of Route 138, the right-of-way is not visible. Viewpoint No. 32 is of the intersection of the Stoughton Line with the Whittenton Branch, with Route 138 in the background.

Grade Crossing near King Philip Street, east of Route (No. 35)

This viewpoint of the grade crossing of the Stoughton Line was observed facing east on King Philip Street (east of Route 138) in Raynham (Figure 4.5-12). King Philip Street is a two-lane suburban roadway with no sidewalks or shoulder and a moderate curve at this viewpoint. The view along King Philip Street is forested and residential on both sides. As this is an inactive right-of-way, there are no grade-crossing elements. The right-of-way is difficult to discern; it is marked by log posts at either side of the road and can be found in the center of the photograph. The right-of-way itself has become a residential driveway on the north side of King Philip Street. This viewpoint was selected because the Stoughton Alternatives would introduce a grade crossing at this location.

Grade Crossing near East Brittania Street, Raynham (No. 35a)

This viewpoint of the grade crossing of the Stoughton Line was observed facing south crossing East Brittania Street in Raynham. The right-of-way portion in Pine Swamp is occupied by the overhead utility line in the foreground crossing East Brittania Street. The right-of-way then extends further south in a forested area vegetated area (Figure 4.5-13). East Brittania Street is a two-lane suburban roadway with no sidewalks or shoulder and relatively straight at this viewpoint. The view along East Brittania Street is forested on both sides. As this is an inactive right-of-way, there are no grade-crossing elements. The northern portion of the right-of-way is discernible from East Brittania Street looking north due to the clear cut vegetation maintenance for the overhead utility line, which cuts a visual corridor through Pine Swamp. The overhead utility line, however does not extend southward, across East Brittania Street. Unlike the northern portion of the right-of-way through Pine Swamp, the portion of the right-of-way extending south of East Brittania Street is not clear-cut and thus overgrown with mature trees. The right-of-way south of East Brittania Street is thus not easily discernible. This viewpoint was selected because the Stoughton Alternatives would introduce a grade crossing at this location.

Right-of-Way and Grade Crossing from Thrasher Street (Nos. 36, 37)

Two viewpoints of the Stoughton Line right-of-way and the grade crossing were taken from Thrasher Street in Taunton (Figure 4.5-14). Viewpoint 37 is south-facing, showing a wide, forested corridor sunken below surrounding grade flanking the right-of-way. The rolling nature and groundcover on the right-of-way in this location mask its former use as an operative railroad. The right-of-way is flanked by forest and, at Malcolm Circle in Taunton, by residences. The right-of-way north of Thrasher Street is less clear, as noted in the next viewpoint.

Viewpoint 36 is observed along Thrasher Street looking east towards the rail right-of-way. The view along Thrasher Street shows forest north of the roadway and residences to the south. To the south, the right-of-way is visible below street level, i.e., depressed relative to surrounding grade; Thrasher Street is a narrow, two-lane roadway with no shoulder or sidewalks and exhibits a sharp curve at this viewpoint. There are no guardrails. A row of boulders and wood and wire fencing, at the right of Viewpoint 36, act as barriers to access. There are currently no grade-crossing elements at this crossing, as it is not in active use. This viewpoint was selected because the Stoughton Alternatives would introduce a grade-separated crossing at this location, which is characterized by an already depressed right-of-way relative to surrounding grade.

Taunton River Bridges from Summer Street (No. 39)

Two rail bridges crossing the Taunton River are observed from this viewpoint taken from Summer Street/Route 140 looking north in Taunton (Figure 4.5-15). This viewpoint shows the forested corridor of the Stoughton Line heading north. The bridges are constructed of cement and wood. The bridges are constructed of wood on pilings. The water supply line shown on the two bridges is a recent addition to this viewpoint. This viewpoint was selected because the bridges would require upgrades.

Taunton River Bridge from Ingell Street (No. 40)

The New Bedford Main Line crosses the Taunton River just south of the intersection of the Attleboro Secondary and Stoughton Line in Taunton (Figure 4.5-16). This viewpoint is of the forested rail corridor and one of the bridges that cross the Taunton River. The bridge was viewed from the right-of-way southeast of the Taunton Department of Public Works yard on Ingell Street. This bridge is constructed of wood on pilings. The viewpoint was selected for its potential to be viewed by the public from the Taunton River and because the bridge may require upgrades as part of the Stoughton Alternatives.

Whittenton Alternatives

This section describes typical (or representative) views of the Whittenton Branch corridor from public streets. The Whittenton Alternatives, which would use the Whittenton Branch of the Stoughton Route, would avoid construction through the Pine Swamp by restoring service to the Whittenton Branch rail line. The Whittenton Alternatives diverge from the Stoughton Line at Raynham Junction and connect to the New Bedford Main Line at Whittenton Junction in Taunton. The entire Whittenton Branch is currently an inactive railroad right-of-way. Evidence of a right-of-way is visible in some locations, primarily at cross-streets and where the right-of-way has been converted to driveways or paths. General elements of rail lines are not visible.

Whittenton Right-of-Way and Bridge from King Philip Street, West of Route 138 (Nos. 42, 43)

These two viewpoints capture the location of the proposed Whittenton Branch of the Stoughton Line as it would cross over King Philip Street, west of Route 138 in Raynham, in both directions (Figure 4.5-17). The stone bridge abutments, built on either side of King Philip Street, are still present, but the actual bridge crossing the roadway is not present. King Philip Street is a narrow, two-lane suburban roadway without shoulders, flanked by single-family homes. The right-of-way embankment, visible from either side King Philip Street, is forested. This viewpoint was selected because grade crossing upgrades would be required as part of the Stoughton Alternative, Option 4C (now known as the Whittenton Alternative).

Whittenton Right-of-Way at Bay Street (Nos. 44, 45)

Two viewpoints of the Whittenton Branch right-of-way at Bay Street in Taunton were observed (Figure 4.5-18). Viewpoints of the right-of-way in both directions show that where the right-of-way intersects Bay Street, it ends in an embankment and the previous right-of-way under Bay Street has been filled. The right-of-way is heavily forested on either side of the roadway, although a cleared area hints at previous existence of a right-of-way. This viewpoint was selected because Bay Street would be replaced by a bridge.

Bay Street Bridge from Bay Street (No. 46)

A viewpoint facing southeast up Bay Street in Taunton shows the former Bay Street Bridge, a roadway passing over the Whittenton Branch right-of-way that was discussed above (Figure 4.5-18). This viewpoint was selected as the bridge would have to be reconstructed to accommodate a rail right-of-way. Located near downtown Taunton, Bay Street is a two-way roadway with shoulders, surrounded by a mix of uses, including detached residences south of the overpass and a restaurant and other commercial uses north of the overpass. The overpass has a guard rail and jersey barriers protecting a sidewalk from the embankment on the north side and no barrier or sidewalk on the south side.

Whittenton Right-of-Way and Grade Crossing from Warren Street (No. 49)

The right-of-way and grade crossing of the Whittenton Branch was observed from Warren Street in Taunton (Figure 4.5-19). Warren Street is a low-density residential neighborhood and the right-of-way is flanked by single-family homes. As this is an inactive right-of-way, there are currently no grade-crossing elements or tracks. However, the right-of-way is quite visible as a wide, gravel and dirt roadway. Automobile access is possible on the right-of-way, but restricted with swinging metal gates. West of Warren Street, jersey barriers also restrict access and the right-of-way is marked private property. This viewpoint was selected because there is currently no evidence of an operative right-of-way.

Stations

This section discusses the views and aesthetic resources of the proposed station sites, which are shown in Figures 4.5-20 through 4.5-29. All the viewpoints described below were selected because they are possible station sites.

Southern Triangle Station Sites—Common to All Rail Alternatives

The Southern Triangle includes two rail alignments south of Weir Junction. The six stations are common to all Build Alternatives. This section discusses the views and aesthetic resources of the proposed station sites for the Southern Triangle station sites.

Taunton Depot Station (No. 41)—The proposed Taunton Depot (formerly known as East Taunton [North]) Station site is behind the Target Plaza off of Route 140 in Taunton (Figure 4.5-20). The site is currently undeveloped, with half the site cleared and half the site forested. Six large floor-plan retail buildings, on the adjacent shopping plaza, contain numerous retail establishments and are generally in good condition. This proposed station site is not visible from Route 140 due to its location at the rear of an established shopping plaza and is not visible from other sides due to the forest cover.

King's Highway Station (No. 6)—The proposed King's Highway Station site is in a commercially developed area containing traditional strip retail development close to Route 140 in New Bedford (Figure 4.5-21). The site, in the rear of King's Highway Plaza, is highly visible from the intersection of King's Highway and Tarkiln Hill Road. King's Highway Plaza contains occupied buildings and a parking lot. The site contains one large floor-plate, strip-style retail building with approximately eleven establishments, one stand-alone fast-food restaurant building, and associated parking. The establishments are traditional single-story retail establishments in a variety of sizes and ages.

Whale's Tooth Station (No. 7)—The proposed Whale's Tooth Station site is adjacent to Route 18 and accessed from Acushnet Avenue in New Bedford (Figure 4.5-22). It is currently a parking lot, recently completed by the City of New Bedford in anticipation of the proposed project. The only structure on the site is a parking attendant booth. The station site is largely devoid of vegetation and can be viewed from Route 18, adjacent uses, and the higher elevation residences east of Route 18.

Freetown Station (No. 10)—The proposed Freetown Station site is off South Main Street in Freetown (Figure 4.5-23). The site is currently developed as a self-storage facility with associated parking; it is surrounded by open land and forest. The site contains four large storage buildings in fair condition. The station site can be viewed from South Main Street and the adjacent individual residences.

Fall River Depot Station (Nos. 11, 12)—The proposed Fall River Depot Station site is on Davol Street, which runs parallel to Route 138/Route 70 in Fall River (Figure 4.5-24). The station is currently developed as a commercial property with parking. Two buildings and steel framing for an apparent third building exist on the site; all are vacant. One building, a large metal building with five garage bays, was formerly used as a flooring supply warehouse and is in poor/fair condition. The second building, a brick structure, was used for office and storage uses and is in poor/fair condition. All the windows of the brick building have been filled in with concrete blocks or wood. The site is characterized by some vegetation due to inactivity at the site. This site is viewed from Davol Street, Pearce Street, and from the rear of properties across the tracks.

Battleship Cove Station (No. 13)—The proposed Battleship Cove Station site is on Water Street/Ponta Delgada Boulevard in Fall River (Figure 4.5-25). The site contains the Ponta Delgada Plaza, Gates of the City Monument, a circular driveway, and a grassed area. The station would be at the rear of the site, in a currently vegetated area that abuts Route 138/Broadway Extension to the southwest. The station site is visible from Route 138/Broadway Extension and from Eagle Street to the southeast, both of which are at a higher elevation. The site is also visible from the industrial uses along the waterfront and the high-density residential uses southwest of Route 138.

Stoughton and Whittenton Alternatives Station Sites

In addition to the Southern Triangle, the Stoughton Alternatives and the Whittenton Alternatives would provide commuter rail service from South Station through Stoughton to Canton Junction and Weir

Junction. This section discusses the views and aesthetics resources of proposed station sites for the Stoughton and Whittenton Alternatives outside of the Southern Triangle.

Stoughton Station—The relocated Stoughton Station would be a new train station constructed along the Stoughton Line, west of the existing railroad tracks and north of Brock Street. The site is a previously developed area consisting of commercial/industrial businesses, parking areas, and some undeveloped wooded land. It is adjacent to commercial/industrial businesses and residences along Morton Street, residences along Brock Street, and commercial businesses and parking lots on the east side of the railroad tracks. The site is visible from Brock Street immediately west of the grade crossing, and from the rear of the abutting businesses and residences.

North Easton Station Site (No. 23)—The proposed North Easton Station is off Route 138 in Easton, behind the Roche Brothers Shopping Plaza (Figure 4.5-26). The station site is undeveloped and entirely vegetated, but has evidence of earthwork, most likely as a result of the construction of the shopping plaza. In addition to the shopping plaza to the east, the site is adjacent to forested land to the west (where the rail right-of-way would pass) and south. The shopping plaza contains six buildings in excellent condition as all are relatively new. A medical office building adjacent to the proposed station site is the newest building.[5] This site is not visible from Route 138 due to its location at the rear of an established shopping plaza and is not visible from other sides due to the forest cover. The site is visible from the medical office building.

Easton Village Station (Site No. 24)—The proposed Easton Village Station site is off Sullivan Avenue just north of the Easton Town Center (Figure 4.5-27). The station site is adjacent to a historic train station, designed by Henry Hobson Richardson, and a small parking area. The historic train station is in good condition and is the home of the Easton Historical Society. Located in a dense town center, the site is visible only from the roads and parcels surrounding it, which include Shovel Shop Pond, the YMCA and a converted mill building as well as the historic station.

Raynham Park Station Site (No. 29)—The proposed Raynham Park Station site is at the site of the former Raynham-Taunton Greyhound Track, off Route 138 in Raynham (Figure 4.5-28). The station site itself is within a larger, developed site that currently includes a simulcast/off-track betting facility and a parking area. The station site is not visible from the main road because it is accessed via a driveway from the larger Raynham Park recreational site.

Dana Street Station Site—The proposed Dana Street Station site is located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton. This station would only serve the Whittenton Alternatives. The station would be on the east side of the railroad, between the alignment and Dana Street. The approximately 3.53-acre site is a currently vacant lot that appears to have been occupied by an industrial use. The area surrounding the site is densely developed with land uses including commercial, industrial, and residential properties. The station site is visible from Danforth Road to the west due to the absence of vegetation along the site's perimeter. The residential developments west of Danforth Road do not have direct or unobstructed views into the site due to vegetation screening and the orientation of the residential development. The station site is partially visible from Dana Street to the north. The parcels north of Dana Street opposite the station site have a partial view into the site. However this area is vacant. No public views are available into the Dana Street station site from the south, as this area is occupied by an existing rail line. Public views into the Dana

[5] The building is not shown on the 2005 MassGIS orthophoto in Figure 4.5-26 since it was constructed after 2005.

Street from the east are not available as the parcel south of the station site is occupied by auto-related industrial land uses.

Taunton Station (Dean Street) Site (No. 38)—The proposed Taunton (Dean Street) Station site, which would only serve the Stoughton Alternatives, is off Arlington Street in Taunton (Figure 4.5-29). The site is a formerly developed parcel now containing vacant buildings and other derelict areas as a result of fire. The site is in a developed area, and is visible from the intersection of Dean and Arlington Streets (south), from the frontage at Arlington Street and the residences lining that street (west), and from the town playing fields on Longmeadow Avenue east of the site, across the rail right-of-way.

Layover Facilities

This section discusses the views and aesthetic resources of the two identified layover facility sites – the Wamsutta site along the New Bedford Main Line and Weaver's Cove East site along the Fall River Secondary. Layover facility plans are conceptual at this point, consisting only of general layouts and footprints. Tracks at the train layover facilities would diverge from the respective through lines (Fall River Secondary, or New Bedford Main Line) and consist of a series of short parallel spurs upon which trains would be parked for overnight layovers and light maintenance work. Parking areas for employees would be included within the facilities, and hooded lights would minimize light pollution. Small site structures are planned for storage and personnel change rooms. The facilities would be fenced and lighted for security. Engineering plans will be completed for these facilities once the LEDPA has been determined.

Wamsutta Layover Facility Site

The proposed Wamsutta layover facility would be constructed along the New Bedford Main Line and would serve all Build Alternatives. It would be located in New Bedford near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main Line, just north of the Whale's Tooth Station.

The Wamsutta site is a previously developed site, currently used as a rail yard for CSX, within an industrial area. The site is visible from adjacent roads and buildings. Adjoining properties are transportation corridors or industrial in nature. Industrial sites are located north, east, and south of this location, and Route 18 to the west. No commercial or residential properties, or open spaces, are located in close proximity to this site.

Weaver's Cove East Layover Facility Site

The proposed Weaver's Cove East layover facility would be constructed along the Fall River Secondary and would serve all Build Alternatives. It would be located in Fall River west of Main Street between the existing Fall River Secondary and Main Street, approximately 2.5 miles from the southern terminus of the Fall River Secondary.

Currently vacant land, a portion of the Weaver's Cove East site was previously developed. Approximately one-half of the site is cleared of vegetation or includes remnant building foundations; the remainder of the site is vegetated. Surrounding land to the north, east, and south is residential; industrial land use is present to the southwest. Undeveloped land is immediately west of the site, adjoining the Taunton River. The industrial site to the southwest is a former Shell Oil facility, and consists of completely cleared land with several large aboveground storage tanks and a short shipping

dock. The layover facility site is partially visible from the adjacent properties, somewhat obscured from view by vegetation. The layover facility would be visible from the Taunton River. As discussed below, this segment of the Taunton River has been designated as a "recreational river area," recognizing its aesthetic value and developed shoreline.

4.5.3 Analysis of Impacts

4.5.3.1 Introduction

For the purposes of this assessment, "visual and aesthetic resources" refers to the visible natural and built environment surrounding the various components of the alternatives, and this analysis examines changes in the physical appearance of that environment from a ground-level viewer's perspective. The following assessment identifies any changes in the visual setting that could have adverse impacts on the visual and scenic resources of importance to residents. The visual impacts are based upon examples or conceptual views of the major components of each of the alternatives as compared to the existing character of the surrounding environment. Visual impacts to historic resources are analyzed separately in Chapter 4.8, *Cultural Resources*.

4.5.3.2 Methodology

This section summarizes the methodology used to evaluate the potential direct and indirect effects of the South Coast Rail project to visual and aesthetic resources.

As required by the CEQ under NEPA,[6] the analysis of the environmental consequences includes discussion of the direct and indirect effects of a proposed action and their significance. Direct effects are defined as those "which are caused by the action and occur at the same time and place."[7] Indirect effects are defined as those "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."[8]

Similarly, MEPA requires "a detailed description and assessment of the negative and positive potential environmental impacts of the Project and its alternatives. The Environmental Impact Report (EIR) shall assess (in quantitative terms, to the maximum extent practicable) the direct and indirect potential environmental impacts from the Project that are within the Scope. The assessment shall include both short-term and long-term impacts for all phases of the Project (e.g., acquisition, development, and operation) and cumulative impacts of the Project, any other Projects, and other work or activity in the immediate surroundings and region."[9]

The following paragraphs describe how potential direct and indirect effects of the South Coast Rail alternatives to visual and aesthetic resources were evaluated.

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[6] EPA. 2009. Code of Federal Regulations (CFR), *Title 40: Protection of the Environment, Part 1502- Environmental Impact Statement, Section 1502.16 Environmental Consequences* (40 CFR 1502.16).

[7] 40 CFR 1508.8(a).

[8] 40 CFR 1508.8(b).

[9] Massachusetts Environmental Policy Act Office. 2009. 301 CMR 11.00: *MEPA Regulations. Section 11.07: EIR Preparation and Filing, (6) Form and Content of EIR, (h) Assessment of Impacts.* Commonwealth of Massachusetts, Environmental Policy Act Office: Boston.

Direct Effects

Potential direct effects to visual and aesthetic resources were evaluated by examining preliminary engineering plans to identify new construction or significant reconstruction of existing facilities that may change the visual environment. Specifically, the following items were evaluated:

- Railroad improvements (upgrades to existing railroad track);
- Railroad construction (new track in active, abandoned, or previously unused railroad corridors);
- Railroad crossings (at-grade and grade separated crossings);
- Station reconstruction or construction (existing or new rail and/or bus stations);
- Layover facility construction (new spur tracks for overnight train storage); and
- For electric-powered alternatives, electrical infrastructure construction or upgrades (overhead catenary system and traction power facilities).

Preliminary engineering plans, conceptual views, and existing examples of similar facilities were reviewed and compared to current conditions to identify substantial changes in the visual environment. The existing visual environment is documented above in Section 4.5.2.

Visual impacts were qualitatively assessed based on a combination of the visibility of the specific component being evaluated and the context of the existing visual environment in which the component would be located.

The following ranking system was used:

- None: No visual impact would result because the evaluated component would not be visible to the general public and/or would not be different in character than the existing visual environment.
- Minimal: Visual impacts would be minor because the evaluated component would be only incidentally visible to the general public and/or would be a minor change from the existing visual environment.
- Moderate: Visual impacts would be modest because the evaluated component would be partially visible to the general public and/or would be a moderate change from the existing visual environment.
- Substantial: Visual impacts would be noteworthy because the evaluated component would be visible to the general public and/or would be a considerable change from the existing visual environment.

Changes in the visual and aesthetic environment may also affect the context in which cultural resources are viewed. This issue is specifically addressed in Chapter 4.8, *Cultural Resources*.

Indirect Effects

Indirect effects to visual and aesthetic resources may result from induced growth such as TOD in the vicinity of the train or bus stations. These indirect effects are addressed in a separate analysis described in Chapter 5, *Summary of Indirect Effects and Cumulative Impacts.*

4.5.3.3 Impacts of Alternatives by Element

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would improve transit service to Boston from New Bedford, Fall River, and Taunton by adding more buses but using smaller capital investments than are proposed in the Build Alternatives. Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts.

The No-Build Alternative plan includes bus schedule enhancements, transportation demand management, and transportation policy enhancements for commuter bus. In addition to these enhancements, financial incentives would be offered by the Commonwealth to encourage the private commuter bus service operators to acquire a new fleet of fuel efficient and clean emission buses. The intent of these measures would be for these buses to provide rider comfort and amenities comparable to commuter rail service.

The existing highway alignments present a visually disturbed environment from natural conditions. The alignments would not change and no new highway construction would be required for the No-Build Alternative. Using these highways for this alternative would not affect any visual or aesthetic resources.

Park-and-Ride Lot Expansion/Bus Stations

Three existing Park-and-Ride facilities would be expanded or re-striped to improved capacity and traffic flow as part of the No-Build Alternative, as summarized below. The three affected Park-and-Ride facilities are:

- The West Bridgewater Park-and-Ride, located near the southwest corner of the intersection of Routes 106 and 24 in West Bridgewater;
- The Mount Pleasant Street Park-and-Ride, located on the northwest corner of the intersection of King’s Highway and Route 140 in New Bedford; and
- The Silver City Galleria Park-and-Ride, adjacent to the Silver City Galleria shopping mall in Taunton.

The Mt. Pleasant Street park-and-ride lot in New Bedford operates at approximately 80 percent of capacity. If future ridership projections for the area indicate a significant increase in ridership for this region, an expanded park-and-ride/bus station may have merit in the existing lot, on adjacent land, or at another suitable location in the general area.

A review of available information and parking occupancy studies indicates that a bus station/park-and-ride facility in the West Bridgewater area, near the existing Route 106/Route 24 park-and-ride lot, would be readily utilized. A bus station and park-and-ride could be combined into one potential intermodal station near the existing park-and-ride lot. The existing park-and-ride lot at Route 106 in West

Bridgewater operates at capacity, as does the existing park-and-ride lot at Route 104 in Bridgewater. These two lots also do not allow buses to enter or exit the lots to pick up or drop off commuters. Although plans are underway to provide 40 more spaces at the West Bridgewater park-and-ride, a new park-and-ride/bus station could provide full bus access /egress and larger park-and-ride facilities. This might capture additional riders for all three commuter bus services that travel by this location via Route 24.

As the existing Silver City Galleria Park-and-Ride is at capacity, existing paved parking lots nearby that appear vacant may be used for a potential new expanded park-and-rid/bus station, or other sites could be identified in the immediate area around the Silver City Galleria and the Route 24/Route 140 highway interchange. A new facility at or near the mall could easily integrate local fixed route GATRA bus service which already serves the mall throughout the day. This linkage to local fixed route bus service could also encourage ridership on commuter bus.

Additional signage may be installed at the park-and-ride/bus facilities to direct motorists to parking areas. The impacts to the visual environment from streetscape changes as a result of potential park-and-ride lots/bus station expansions would be an incremental addition to the existing conditions.

Southern Triangle

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all Build Alternatives. These rail lines form a rough triangular shape running south from Myricks Junction to Fall River (the Fall River Secondary) and from Weir Junction through Myricks Junction to New Bedford (the New Bedford Main Line), and are therefore referred to as the Southern Triangle (Figure 1.4-1). The following sections describe the environmental consequences to visual and aesthetic resources that may result from new construction for these two components of the South Coast Rail project. The northern part of the South Coast Rail study area is described in subsequent sections for each alternative.

Visual and Aesthetic Impacts along the Fall River Secondary Rail Segment

The 12.3 miles of existing freight track along the Fall River Secondary would be upgraded and maintained to Federal Rail Administration (FRA) Class 7 options[10] for the South Coast Rail project. The line would be double-track from Weir Junction to Myricks Junction, with a 0.9-mile third track for freight movements near Taunton Depot Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 mile. The remainder of the line would be single-track, with the exception of 1.8-mile double-track section in Freetown and a 1.7-mile section in New Bedford. The public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. Grade crossings would be closed or consolidated whenever feasible. The existing freight service using the Fall River Secondary is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and two new traction power facilities would need to be constructed for the electric alternatives. Potential direct impacts to visual and aesthetic resources resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one new station would be constructed in Freetown (Freetown). One new layover facility would be constructed in Fall River at the Weaver’s Cove East site. Potential direct impacts to visual and aesthetic resources

[10] FRA. 2009. 49 CFR 213.9 Classes of Track: Operating Speed Limits. US Department of Transportation, Federal Rail Administration.

resulting from constructing the new stations and layover facility along the Fall River Secondary are considered in the Stations and Layover sections, respectively.

Beginning at Myricks Junction, the Fall River Secondary (as shown in Figure 1.4-1) passes through low density residential development, undeveloped land, and open space in Berkley, Lakeville, and Freetown. Passengers' views from the trains would be principally of residences, forest (including the Freetown-Fall River State Forest), and occasional ponds or rivers through most of this segment. Some industrial and commercial developments would also be visible, and the railroad crosses or parallels major highways such as Routes 24 and 79. Approaching Fall River, the alignment runs along the east bank of the Taunton River, with expansive views to the west.

Segments of the Taunton River were recently designated[11] as "scenic" or "recreational" river areas under the Wild and Scenic Rivers Act,[12] the segment along this portion of the Fall River Secondary is designated as a "recreational river area," which is defined by the Act as a segment with a partially developed shoreline and ready access.[13] Within Fall River, land development intensifies, with dense residential development, industrial properties, and commercial districts adjacent to and visible from the railroad. Near the end of the line, the railroad passes historic sites such as the Fall River Heritage State Park, with views of the World War II battleship U.S.S. Massachusetts. The final stop of the passenger rail service would be the Battleship Cove Station, at the Ponta Delgada monument. This location commemorates the City of Fall River's sister city, Ponta Delgada, through a recreation of the City Gates of Ponta Delgada in Sao Miguel, Azores.

Components of the Fall River Secondary improvements that would potentially change the visual and aesthetic environment are:

- Railroad upgrades, including track, railroad bed, bridges, and culverts;
- At-grade crossing improvements, including modern lights, automatic gates, curbs, and painted signage for traffic control; and
- Electrical infrastructure construction (electric alternatives only), including overhead catenary system and traction power facilities.

Railroad upgrades are not expected to substantially affect the visual environment along the Fall River Secondary for passengers, occupants of adjoining properties, or passers-by. The functionally upgraded track, railroad bed, bridges, and culverts would appear similar to the existing visual environment. The railroad upgrades within this portion of the Fall River Secondary within 0.25 mile of the Taunton River will not degrade the existing visual character of the partially developed shoreline along this "recreational river area" and no railroad bridges cross the river in this segment. For safety considerations, the right-of-way would be fenced where it passes through dense residential or downtown areas, presenting a minor visual impact by the addition of a chain-link fence to these environments.

[11] *Omnibus Public Lands Management Act of 2009*.
[12] *Wild & Scenic Rivers Act.* (16 USC 1271-1287); Public Law 90-542. 1968.
[13] No segment of the Taunton River was designated as "wild" (free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and unpolluted) and no segments adjacent to the Fall River Secondary are designated as "scenic" (free of impoundments, with shorelines and watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads).

Improving or reconfiguring the at-grade crossings would affect the appearance of these areas. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems. Each crossing would be supported by a minimum 8-foot by 8-foot aluminum shed that would house the AHCW system. The houses would be placed at the most advantageous quadrant of the crossing to not impede sight distance of pedestrians, motorists, and train engineers. Existing lights and gates would be replaced with new structures to improve safety; the new structures would be intentionally more visible than the existing lights and gates, for greater contrast with the existing visual environment. Ground level traffic controls (curbs and painted signage) are not expected to substantially alter the existing visual environment. The at-grade crossings would be visible principally to automobile drivers and passengers, as well as occupants of adjacent properties. The crossings would be only incidentally visible to train passengers. A photograph of a modern at-grade crossing on another railroad line is provided in Figure 4.5-30.

Constructing the electrical infrastructure necessary to support the electric alternatives would affect the visual environment along portions of the Fall River Secondary by introducing new metal structures and wires into a rural setting. The overhead catenary system would include catenary supports at regular intervals, and electrical wires along the length of the line. The overhead catenary system would be visible to occupants of adjacent properties and automobile drivers and passengers at crossing or paralleling locations. In segments where the visual environment is particularly sensitive, the catenary supports may be designed to a lower profile appearance to minimize effects on surrounding visual environment. Photographs of typical overhead catenary systems on another railroad are provided in Figure 4.5-31.

Two new traction power facilities, paralleling stations, would be constructed in Fall River to deliver electric power from the regional transmission lines to the overhead catenary system. Paralleling stations contain less equipment than the main substation and switching stations and require a 40-foot by 80-foot site. One paralleling station (PS-5) would be adjacent to the Fall River Depot Station, and would be visible to passengers, other users of the station, occupants of adjacent properties, and potentially to passers-by on Route 138. Figure 4.5-33 shows the proposed traction power system and Figure 4.5-32 provides photographs of existing similar-appearing traction power facilities along another railroad line. The second paralleling station (PS-4) would be located in Freetown. Although it would be visible to passengers, other users of the stations and potentially from adjacent uses, it would not be expected to substantially alter the visual environment.

Visual and Aesthetic Impacts along the New Bedford Main Line Rail Segment

The 19.4-mile existing freight tack along the New Bedford Main Line would be upgraded to FRA Class 7 options for the South Coast Rail project. The line would be double-track from Weir Junction to Myricks Junction, with a 0.9-mile third track for freight movements near Taunton Depot Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 mile. The remainder of the line would be single-track, with the exception of 1.8-mile double-track section in Freetown and a 1.7-mile section in New Bedford. The existing public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. Grade crossings would be closed or consolidated whenever feasible. The existing freight service using the New Bedford Main Line is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and four traction power facilities would be constructed for the electric alternatives. Potential direct impacts to visual and aesthetic resources resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

Two new train stations would be constructed in New Bedford (Whale's Tooth and King's Highway) and one new train station would be constructed in Taunton (Taunton Depot). One new layover facility would be constructed in New Bedford at the Wamsutta site. Potential direct impacts to visual and aesthetic resources resulting from the constructing and using the new stations and layover facilities along the New Bedford Main Line are considered in the sections on Stations and Layovers, respectively.

Beginning at Weir Junction, the New Bedford Main Line (as shown in Figure 1.4-1) crosses the Taunton River and passes through undeveloped land, open space, and low density residential development, in Taunton, Berkley, Lakeville, and Freetown. Passengers' views from the trains would be principally of forest (including the Assonet Cedar Swamp), occasional ponds or rivers (including a "recreational river area" segment of the Taunton River), and residences through most of this segment. Industrial development begins in southern Freetown and increases in density in New Bedford; the industrial sites would be visible, as would the Acushnet Cedar Swamp open space in northern New Bedford. The railroad crosses Route 140 as it enters the densely developed part of New Bedford; views from the train would include industrial and residential development in this segment. Historic downtown New Bedford, near the New Bedford Whaling National Historic Park, would be visible to passengers. After crossing Route 18, the final stop of the passenger rail service would be the Whale's Tooth Station in a commercial/industrial area.

Components of the New Bedford Main Line improvements that would potentially change the visual and aesthetic environment are:

- Railroad upgrades, including track, railroad bed, bridges, and culverts;
- At-grade crossing improvements, including modern lights, automatic gates, curbs, and painted signage for traffic control; and
- Electrical infrastructure construction (electric alternatives only), including overhead catenary system and traction power facilities.

Railroad upgrades are not expected to substantially affect the visual environment along the New Bedford Main Line for passengers, occupants of adjoining properties, or passers-by. The upgraded track, railroad bed, bridges (with one exception), and culverts would appear similar to the existing visual environment. For safety considerations, the right-of-way would be fenced where it passes through dense residential or downtown areas, presenting a minor visual impact by the addition of a chain-link fence to these environments.

As noted above, segments of the Taunton River were recently designated as "scenic" or "recreational" river areas. The New Bedford Main Line crosses the Taunton River in Taunton, immediately south of Weir Junction. This segment of the river is designated as a "recreational river area." The existing single track bridge at this location was constructed in 1906 and partially rebuilt in 1942.[14] It is approximately 130 feet long, consists of four spans of varying lengths, was constructed as a combination of open deck beams and thru-girders, and is supported by three sets of steel H-pile piers and concrete and stone masonry abutments. This bridge is in poor condition, and is structurally inadequate to support the proposed train loads (or number of tracks) required for the South Coast Rail project.

[14] Vanasse Hangen, Brustlin, Inc. (VHB) 1995. Undergrade Bridge Inspection and Rating Report, MBTA New Bedford/Fall River Commuter Rail Project. Vanasse Hangen Brustlin, Inc.: Boston.

The proposed replacement structure is envisioned to be a two-span, two-bay, ballasted steel plate thru girder superstructure carrying two sets of tracks. There would be three total girders, with two exterior and one common interior girder. New cast-in-place concrete abutments would be constructed behind the existing abutments, increasing the span length. The existing abutments would be partially removed to an elevation equal to the river's average seasonal high water elevation. The space between the existing and proposed abutments would be graded to reconnect the stream banks on either side of the bridge. The existing piles would be removed to one foot below grade. This design would enable riverbank and wildlife passage to be restored in front of the new abutments. The proposed bridge configuration would reduce the number of piers within the waterway, providing a cleaner, more consistent appearance, and the ballasted superstructure would help to suppress vibration noise during train crossings.

The proposed bridge would permanently alter the visual environment of the recreational river area, but the visual character of this partially developed shoreline would not be adversely affected. The bridge construction activities, potentially including cofferdams, would temporarily adversely impact the visual character of the river in this segment.

Improving or reconfiguring the at-grade crossings would affect the appearance of these areas. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art AHCW systems. Each crossing would be supported by a minimum 8-foot by 8-foot aluminum shed that would house the AHCW system. The houses would be placed at the most advantageous quadrant of the crossing to not impede sight distance of pedestrians, motorists, and train engineers. Existing lights and gates would be replaced with new structures to improve safety; the new structures would be intentionally more visible than the existing lights and gates, for greater contrast with the existing visual environment. Ground level traffic controls (curbs and painted signage) are not expected to substantially alter the existing visual environment. A more visible change would be implemented at the Tarkiln Hill Road crossing in New Bedford. Tarkiln Hill Road would be closed on the west side of the tracks, and traffic routed to King's Highway, which intersects the current alignment of Tarkiln Hill Road at the crossing location (Figure 4.5-34). East of the crossing, the existing Tarkiln Hill Road alignment would remain, but with modern at-grade crossing improvements. The at-grade crossings would be visible principally to automobile drivers and passengers, as well as occupants of adjacent properties. The crossings would be incidentally visible to train passengers. A photograph of a modern at-grade crossing on another railroad line is provided in Figure 4.5-30.

Constructing the electrical infrastructure necessary to support the electric alternatives would affect the visual environment along portions of the New Bedford Main Line by introducing new metal structures and wires into a rural setting. The overhead catenary system would include catenary supports at regular intervals, and electrical wires along the length of the line. The overhead catenary system would be visible to occupants of adjacent properties and automobile drivers and passengers at crossing or paralleling locations. In segments where the visual environment is particularly sensitive, the catenary supports may be designed to a lower profile appearance to minimize impacts to surrounding visual environment. Photographs of typical overhead catenary systems on another railroad are provided in Figure 4.5-31.

Four new traction power facilities would be constructed along the New Bedford Main Line to deliver electric power from the regional transmission lines to the overhead catenary system. Figure 3-33 shows the proposed locations of the traction power facilities and Figure 3-32 provides photographs of existing similar traction power facilities along another railroad line. One traction power substation (TPSS-2)

would be located in New Bedford. Traction power substations (or main substations) draw power from the utility power grid. A typical main substation site is 150 feet by 200 feet. Two new paralleling stations, each which require a 40-foot by 80-foot site, would be constructed along the New Bedford Main Line; one each in New Bedford (PS-6) and Freetown (PS-3). Switching stations are required where two sections of the traction power system powered from different main substations meet; switching station sites can be as large as 60 feet by 150 feet. One switching station (SWS-2) would be located in Berkley where the Fall River Secondary joins the New Bedford Main Line. The paralleling and switching stations would be visible from nearby vantage points, but are not expected to substantially affect the visual environment. The traction power substation would adversely impact the visual environment from adjacent locations.

Stoughton Electric Alternative

The Stoughton Electric Alternative north of the Southern Triangle would be comprised of a portion of the Northeast Corridor and the entire Stoughton Line. This alternative would use 15.5 miles of the existing Northeast Corridor track infrastructure between from South Station to Canton Junction. From Canton Junction, the existing, active Stoughton Line would be used to Stoughton Station. Commuter rail service would be extended along the Stoughton Line using an out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton, at which point this alignment joins the New Bedford Main Line.

The Stoughton Electric Alternative does not include any construction along the Northeast Corridor. The existing single track Stoughton Line would be upgraded to FRA Class 7 for the Stoughton Electric Alternative. A new second track would be constructed from Canton Junction to the existing Stoughton Station, a distance of 3.8 miles, where existing passenger service ends. A new double track would extend south of Stoughton Station to the proposed North Easton Station. The remainder of the line south to Weir Junction would be single- track, with a 2.2-mile long double-track section in Raynham, and a 0.6 mile long double-track section in Taunton. Approaching Weir Junction, an additional 0.4 mile siding track would be provided for freight use only. All of the existing at-grade road/railroad crossings would be reconfigured and/or improved to meet current safety standards. Grade crossings would be closed or consolidated whenever feasible. New catenary supports and wires would be constructed along the length of the line, and four new traction power facilities would be constructed. Potential direct impacts to visual and aesthetic resources resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

This evaluation focuses on the existing and extended Stoughton Line segment from Canton Junction to Weir Junction. The shared Southern Triangle segment of the Build Alternatives was addressed in the preceding section, and no construction is proposed for the Northeast Corridor portion of the alignment.

One existing train station (Canton Center) along the active portion of the Stoughton Line would be reconstructed. Five new train stations (Stoughton, North Easton, Easton Village, Raynham Park, and Taunton) would be constructed. No new layover facilities would be constructed along this segment. Potential direct impacts to visual and aesthetic resources from reconstructing the existing and developing the new stations along the Stoughton Line are considered in the Stations section.

Beginning at Canton Junction, the active portion of the Stoughton Line passes through high density commercial, industrial, and residential development in Canton and Stoughton. The active portion of the Stoughton Line, beginning at just south of the Stoughton Station, passes through a mixture of moderate density commercial, industrial, and residential development. The visual environment from Canton

Junction to the southern portion of the town of Stoughton would be variable from the riders' perspective, including all of these components. The visual environment in the southern portion of Stoughton is marked by the Stoughton Memorial Conservation Land on the west side of the alignment. This area is predominantly forested open space but with interspersed low density residential and commercial development. Views to the east in this segment would be similar in character but dominated by the Route 138 highway and commercial development paralleling the railroad.

Entering Easton, the alignment passes through additional open space and is adjacent to low- to moderate-density rural development, with development density increasing in downtown Easton and adding commercial and industrial elements. In Easton Village, the railroad passes through or near the H. H. Richardson Historic District and the North Easton Historic District. The existing train station in Easton is a national historic landmark (the new Easton Village Station would be located immediately south of this site). The visual environment transitions back to low and moderate density development as the railroad alignment continues south. Views from the train would include forested open space, residential development, and recreational sites (golf courses) in this segment. The railroad enters the Hockomock Swamp ACEC and Wildlife Management Area in the southern portion of Easton, with only open space land use after crossing an electrical transmission line corridor. Views from the train in this segment would be exclusively of forested land until the alignment enters Raynham and passes the Raynham Park former greyhound dog racing track and some industrial development. Views from the train in this segment would include both open space and this recreational/industrial property. The Stoughton Line crosses I-495, passing through or near a commercial business district as it crosses Route 138. The visual environment then changes as it briefly passes through moderate density residential development before entering the Pine Swamp open space just north of Taunton. The visual environment in Taunton is a mixture of residential, commercial, and industrial development with some open space. Passengers on the Stoughton Line would view the Taunton River three times before the railroad joins the New Bedford Main Line at Weir Junction (described above). The Taunton River crossings are within a segment of the river designated as a "recreational river area" within the National Wild and Scenic Rivers System through the National Park Service.

Components of the Stoughton Line improvements and construction for the Stoughton Electric Alternative that would potentially change the visual and aesthetic environment are:

- Railroad upgrades and construction, including track, railroad bed, bridges, and culverts;
- Trestle construction, consisting of a low-rise bridge about the existing railroad bed;
- At-grade grade crossing improvements and construction, including modern lights, gates, curbs, and painted signage for traffic control;
- Grade-separated crossing construction, consisting of a road bridge over the railroad;
- Frontage road construction, consisting of a short segment of paved road along a portion of the line in Stoughton; and
- Electrical infrastructure construction, including overhead catenary system and traction power facilities.

Railroad upgrades would minimally affect the visual environment along the existing, active Stoughton Line for passengers, occupants of adjoining properties, or passers-by. The upgraded track, railroad bed,

bridges, and culverts would appear similar to the existing visual environment. For safety considerations, the right-of-way would be fenced where it passes through dense residential or downtown areas, presenting a minor visual impact by the addition of a chain-link fence to these environments.

Reconstructing the railroad along the out-of-service railroad bed from the Stoughton Station south to Weir Junction would substantially affect the visual environment in this segment for occupants of adjoining properties and passers-by. Although the historic railroad bed is present, the tracks were removed in some areas in the late 1950s and much of the alignment is currently used for informal recreation by pedestrians, bicyclists, and all-terrain vehicle (ATV) riders. The limits of disturbance for the new construction of this segment are generally less than 100 feet wide, for wetlands and upland areas, as illustrated in Figures 4.16-2a-2q. The disturbance would include clearing vegetation for the width of the right-of-way along the corridor for safety, visibility, and railroad bed maintenance. Limits of disturbance and vegetation clearing will be minimized to 40 feet wide through special design measures within certain wetland areas, such as the Hockomock Swamp, where a trestle will be constructed. The corridor passes through areas with a variety of land uses, ranging from commercial and industrial to residential and open space. The visual impact from clearing vegetation and reconstructing the railroad within commercial or industrial development, or along active transportation corridors (e.g., highways), would range from minimal to substantial for occupants of adjoining properties and passers-by. Where the alignment passes through or adjacent to residential or open space areas, the visual impact would be more substantially adverse to occupants of adjoining properties and recreationists by the addition of the railroad to a residential or recreational landscape.

As noted above, segments of the Taunton River were recently designated as “scenic” or “recreational” river areas under the National Wild and Scenic Rivers System through the National Park Service. The out-of-service Stoughton Line crosses the Taunton River three times and the tributary Mill River once, immediately north of Weir Junction. All four of these bridges have been recently retrofitted to accommodate a 24-inch diameter water main, attached to the south exterior side of the existing bridge superstructures. This segment of the Taunton River (and including the Mill River within a 0.25-mile wide corridor) is designated as a “recreational river area.” Listed from north to south, these bridges include:[15]

- The 118-foot long bridge across the Taunton River at milepost 34.38 (adjacent to Dean Street) was originally constructed in 1907 and rehabilitated at a later, unknown, date, and currently accommodates one track. The bridge is an open timber deck, steel trestle structure consisting of 11 spans of varying length and superstructure type. The bridge is in poor condition, and is not structurally adequate to support the proposed train loads required for the South Coast Rail project.

- The proposed structure is envisioned to be a two-span, ballasted steel thru girder superstructure carrying a single track. The existing piles would be removed to two feet below grade and a new, pile supported, cast-in-place concrete pier would be constructed in the center of the span. New cast-in-place concrete abutments would be constructed behind the existing timber crib abutments, increasing the span length of the bridge. The existing abutments would then be partially removed to an elevation equal to the river’s average seasonal high water elevation. The space between the existing and proposed abutments would be regraded to recreate the river banks on either side of the bridge.

[15] VHB. 1995. Undergrade Bridge Inspection and Rating Report, MBTA New Bedford/Fall River Commuter Rail Extension Project, Stoughton Line. Vanasse Hangen Brustlin, Inc.: Boston.

- The 171-foot long bridge across the Taunton River at milepost 34.62 was also constructed in 1907 and rehabilitated at a later, unknown date, and currently accommodates one track. This bridge is an open timber deck, steel trestle structure consisting of 15 spans of varying length and superstructure type. The existing bridge is in poor condition, and is not structurally adequate to support the proposed train loads required for the South Coast Rail project.

- The proposed structure is envisioned to be a two-span, ballasted steel thru girder superstructure carrying a single track. The pile would be removed to two feet below grade and a cast-in-place concrete pier would be constructed in the center of the span. New cast-in-place concrete abutments would be constructed behind the existing timber crib abutments, increasing the span length. The existing abutments would be partially removed to an elevation equal to the river's average seasonal high water elevation. The space between the existing and proposed abutments would be graded to recreate the stream banks on either side of the bridge.

- The 176-foot long bridge across the Taunton River at milepost 34.73 was constructed at an unknown date but likely in the same timeframe as the two listed above, and currently accommodates one track. The bridge is an open timber deck, steel trestle structure consisting of 17 spans of varying length. The bridge is in poor condition, and is not structurally adequate to support the proposed train loads required for the South Coast Rail project.

- The proposed structure is envisioned to be a two-span, ballasted steel thru girder superstructure carrying a single track. The piles would be removed to two feet below grade and a cast-in-place concrete pier would be constructed in the center of the span. New cast-in-place concrete abutments would be constructed behind the existing timber crib abutments, increasing the span length. The existing abutments would be partially removed to an elevation equal to the river's average seasonal high water elevation. The space between the existing and proposed abutments would be graded to recreate the stream banks on either side of the bridge.

- The 36-foot long bridge across the Mill River at milepost 34.90 was constructed at an unknown date but likely in the same timeframe as the two listed above, and currently accommodates one track. This bridge is an open timber deck structure consisting of a single span and is supported by two steel plate girders. The bridge is in poor condition, and is not structurally adequate to support the proposed train loads required for the South Coast Rail project.

- The proposed structure is envisioned to be a single-span, ballasted steel tub superstructure carrying a single track. New cast-in-place concrete abutments would be constructed behind the existing abutments, increasing the span length. The existing abutments would be partially removed to an elevation equal to the river's average seasonal high water elevation. The space between the existing and proposed abutments would be graded to reconnect the stream banks on either side of the bridge.

The existing 24-inch water main would be temporarily relocated off the existing bridges, to facilitate their demolition and the construction of the proposed replacement bridges. It is envisioned that the

water main would be supported during construction operations by means of temporary utility bridges, located within close proximity to the railroad bridges. In conjunction with the installation of ballast and rail, the existing water main would be relocated onto the new bridge superstructures. At this time, the temporary utility bridges would be permanently removed.

The proposed replacement bridges are configured to enable riverbank reconstruction and wildlife passage in front of the new abutments. In addition, these bridge configurations would reduce the number of piers within the waterway, providing a cleaner, more consistent appearance and better accommodating boaters, and the ballasted superstructures would help to suppress vibration noise during train crossings.

The visual environment of the recreational river area would be permanently altered by the new bridges, but the visual character of this partially developed shoreline would not be adversely affected. The bridge construction activities, potentially including cofferdams, would temporarily adversely impact the visual character of the river in this segment.

A trestle would be constructed for the portion of the railroad passing through the Hockomock Swamp area to allow for wildlife passage and to maintain the current hydrologic regime. The trestle (including catenary structures similar to the rest of the railroad) would be distant from any homes, businesses, or roadways and therefore not visible from those locations. Vegetation clearing along this portion would be limited to a 40-foot width to accommodate safe passage of the trains. A conceptual view of the trestle is provided in Figure 4.5-35. Photographs of typical overhead catenary systems on another railroad are provided in Figure 4.5-31.

Improving, reconfiguring, or constructing the at-grade crossings would moderately affect the appearance at these locations. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems. Each crossing would be supported by a minimum 8-foot by 8-foot aluminum shed that would house the AHCW system. The houses would be placed at the most advantageous quadrant of the crossing to not impede sight distance of pedestrians, motorists, and train engineers. Existing lights and gates within the active Stoughton Line segment would be replaced with new structures to improve safety; the new structures would be intentionally more visible than the existing lights and gates, for greater contrast with the existing visual environment. Ground level traffic controls (curbs and painted signage) are not expected to substantially alter the existing visual environment. The at-grade crossings would be visible principally to automobile drivers and passengers, as well as occupants of adjacent properties. The crossings would be incidentally visible to train passengers. A photograph of a modern at-grade crossing along another railroad line is provided in Figure 4.5-30.

Within the inactive segment of the Stoughton Line, constructing modern railroad crossings where old crossings have been removed (or were never present) would affect the visual environment at these locations through the addition of metal structures and lights in new locations. Lights, gates, curbs, and/or painted pavement signage would be installed at each crossing. As with the railroad construction itself, the visual impact within commercial or industrial development, or along active transportation corridors (e.g., highways), would be minimal. Where the alignment passes through residential or open space areas (such as near Pine Swamp), the visual impact from adding the at-grade crossings would be moderate, through the introduction of metal structures and lights in a suburban or rural environment. The crossings would be visible to automobile traffic as well as adjacent residents and recreationists, but would be obscured from view from non-adjacent locations.

Constructing the grade-separated crossing at Broadway (Route 138) in Raynham (at mile post 31.31) would substantially affect the appearance of this area. Current plans call for a road bridge crossing above the railroad, depressing the track profile as required to provide adequate vertical clearance under the bridge. The road approaching the overpass from either side would be raised at a shallow angle to allow for appropriate visibility. The visual environment in the vicinity of the crossing, extending into the commercial zones along Broadway in either direction, would be impacted. The grade-separated crossing would be visible principally to automobile drivers and passengers, as well as occupants of adjacent properties. The crossing would be only incidentally visible to train passengers. A photograph of a grade-separated crossing along another railroad line is provided in Figure 4.5-36. Figure 4.5-37 shows the existing conditions at and the location of the proposed Route 138 grade-separated crossing.

Constructing the electrical infrastructure necessary to support the Stoughton Electric Alternative would moderately affect the visual environment along the Stoughton Line. The overhead catenary system would include catenary supports at regular intervals, and electrical wires along the length of the line. The visual impact is anticipated to be minimal within the active segment of the line and within the portions of the inactive segment that pass through commercially developed areas. The visual impact would be more substantial where the currently inactive segment passes through residential or open space areas. The electrical infrastructure would be visible to adjacent residents and recreationists, but would be obscured from view from non-adjacent locations. The electrical infrastructure would be particularly visible to residents of homes adjacent to the railroad, such as near downtown Easton. In segments where the visual environment is particularly sensitive, the catenary supports may be designed to a lower profile appearance to minimize impacts to surrounding visual environment. Photographs of typical overhead catenary systems along another railroad are provided in Figure 4.5-31.

Four new traction power facilities would be constructed to deliver electric power from the regional transmission lines to the overhead catenary system. These include a traction power substation (TPSS-1) and a paralleling station (PS-1) in Easton, a switching station in Canton (SWS-1), and a paralleling station (PS-2) in Taunton. Traction power substation sites are generally 150 feet by 200 feet, switching station sites can be up to 60 feet by 150 feet, and a typical paralleling station site is 40 feet by 80 feet. The traction power facilitates would impact the visual environment from adjacent locations. Most proposed sites for these facilities are generally removed from view by passers-by, therefore they have a visual impact on the surrounding environment, but are not frequently seen. They would be seen by passengers on the trains. Figure 4.5-33 shows the proposed locations of the traction power facilities and Figure 4.5-32 provides photographs of existing similar facilities along another railroad line.

However, paralleling stations 1, 2, and 5 do visually impact the surrounding environment. PS-5 is visible from Durfee Street to the east and Davol Street to the west in a commercial area, as illustrated in Figure 4.6-4c. PS-2 is located in a commercial area with residential populations, as illustrated in Figure 4.6-6g, which will negatively impact the adjacent properties to the west. PS-1 is located in an industrial area and will impact the visual environment of adjacent properties to the east, as illustrated in Figure 4.6-6i.

A frontage road would be constructed along the west side of the Stoughton Line between Morton Street and Totman Farm Road in Stoughton. The 30-foot-wide, 3,500-foot-long road would be paved, with a 6-foot wide sidewalk on the west side. An existing railroad bridge over Totman Farm Road would be reconstructed. The proposed structure is envisioned to be a ballasted steel tub superstructure carrying two sets of tracks. New cast-in-place concrete abutments are likely to be required, due to the current condition of the existing abutments. This portion of the Stoughton Line corridor is currently heavily vegetated; removing the vegetation for the frontage road in addition to the railroad construction

described above would further impact the visual environment in this area by removing the screening provided by the vegetation between the homes west of the railroad and Route 138. The east side of the railroad in this segment parallels Washington Street (Route 138); the west side adjoins low- and medium-density residential development. The frontage road would be visible to residents of adjacent homes and passengers on the train. The visual environment from the eastern perspective (Route 138) would be minimally impacted by the frontage road; the visual environment from the western perspective (homes) would be substantially impacted.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative is identical to the Stoughton Electric Alternative with the exception of the locomotive power source. Diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure, and therefore presents less of a visual impact. There would be no overhead catenary system or traction power facilities for the Stoughton Diesel Alternative. All other aspects of the Stoughton Diesel Alternative relevant to visual and aesthetic resources are the same as for the Stoughton Electric Alternative described above. Within the active segment, visual impacts would be limited to the grade crossing improvements. Within the out-of-service segment, visual impacts would be limited to vegetation clearing, the new at-grade crossings, and the replaced bridges over the Taunton and Mill Rivers.

Overall, the impacts to the visual environment from the Stoughton Diesel Alternative would be less than from the Stoughton Electric Alternative, due to the omission of electrical infrastructure along the Stoughton Line.

Whittenton Electric Alternative

The Whittenton Electric Alternative is identical to the Stoughton Electric Alternative alignment described above except for the segment of the Stoughton Line between Raynham Junction and Weir Junction. Specifically, at Raynham Junction the Whittenton Alternative would divert to the southwest to connect to the abandoned Whittenton Branch. The Whittenton Branch would extend south and west to the Attleboro Secondary at Whittenton Junction. Along the Attleboro Secondary, the Whittenton Alternative would extend to Weir Junction in Taunton. Track infrastructure improvements would include 3.6 miles of new single-track on the Whittenton Branch and 2.2 miles of single-track reconstruction on the Attleboro Secondary with a 0.3-mile siding reserved for the proposed Dana Street Station. The southernmost portion of the Stoughton Line, from Raynham Junction to Weir Junction (a distance of 5.1 miles), would be not be used if this alternative is selected. This evaluation focuses on the Whittenton Branch and Attleboro Secondary components; other components of this alternative are described in the preceding Southern Triangle and Stoughton Electric Alternative sections.

Visual and Aesthetic Impacts along the Whittenton Branch Rail Segment

New track would be placed on the out-of-service Whittenton Branch railroad bed from Raynham Junction to Whittenton Junction. The existing public at-grade road/railroad crossings would be reconfigured and/or improved to current safety standards. New catenary supports and wires would be constructed along the length of the line. No traction power facilities, stations or layover facilities would be constructed along this segment. Potential direct impacts to visual and aesthetic resources resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

Beginning at Raynham Junction, the Whittenton Branch is adjacent to or passes through open space, moderate density residential development, and industrial properties in Raynham and Taunton. The

visual environment throughout this alignment would be variable from the riders' perspective, including all of these components. Notable sights include Prospect Hill Pond (east of the Whittenton Branch) and the Mill River crossing, both in Taunton. Passengers would view undeveloped forest land just prior to where the Whittenton Branch joins the Attleboro Secondary at Whittenton Junction.

Components of the Whittenton Branch improvements and construction for the Whittenton Electric Alternative that would potentially change the visual and aesthetic environment are:

- Railroad construction or reconstruction, including track, railroad bed, bridges, and culverts;
- At-grade crossing improvements and construction, including modern lights, gates, curbs, and painted signage for traffic control; and
- Electrical infrastructure construction, including overhead catenary system and traction power facilities.

Constructing the new railroad to replace the abandoned railroad tracks along the Whittenton Branch would minimally to moderately affect the visual environment in this segment for occupants of adjoining properties and passers-by. Vegetation has overgrown the existing railroad to some extent, although unauthorized all-terrain vehicle use has kept the alignment open. The new construction would require clearing vegetation for the width of the right-of-way (between 60 and 100 feet) in upland areas along the corridor for safety, visibility, and railroad bed maintenance. Vegetation clearing will be minimized within wetland areas, to between 40 and 60 feet wide.

The corridor passes through areas with a variety of land uses, ranging from commercial and industrial to residential and undeveloped land. The reconstructed railroad would be visible to occupants of adjacent properties and passers-by. Replacing bridges, such as at King Philip Street and Bay Street, would change the views along the crossed streets. The Mill River bridge is distinct from the crossing described in the section on the Stoughton Electric Alternative and is more than 0.25-mile from the "recreational river area" of the Taunton River. The bridge replacement here would change the visual environment of the Mill River, but because it is outside of the regulated buffer zone it is not evaluated in the context of the Wild and Scenic River designation of the Taunton River.

The visual impact from clearing vegetation and reconstructing the railroad within commercial or industrial development, or along active transportation corridors such as highways, would be minimal. Where the alignment passes through residential or undeveloped areas, the railroad would be visible and the visual impact would be more substantial by the introduction of rail service through a residential environment. Additionally, for safety considerations, the right-of-way would be fenced where it passes through dense residential or downtown areas, presenting a minor visual impact by the addition of a chain-link fence to these environments. The combination of additional fencing and active rail may dissuade the dumping of yard waste and other debris that presently occurs along the abandoned tracks, providing a potential improvement to the overall visual character of the corridor.

Along the inactive Whittenton Branch, constructing modern railroad crossings where old crossings have been removed (or were never present) would moderately affect the visual environment at these locations. Lights, gates, curbs, and/or painted pavement signage would be installed at each crossing. All crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems. Each crossing would be supported by a minimum 8-foot by 8-foot aluminum shed that would house the AHCW system. The houses would be placed at the most advantageous quadrant of the

crossing to not impede sight distance of pedestrians, motorists, and train engineers. As with the railroad construction itself, the visual impact within commercial development (at Whittenton Street) would be minimal. Where the alignment passes through residential or open space areas (Warren Street), the visual impact from the at-grade crossing will be more substantial. The crossings would be visible to motorists as well as adjacent residents and recreationists, but would be obscured from view from non-adjacent locations. A photograph of a modern at-grade crossing along another railroad line is provided in Figure 4.5-30.

Constructing the electrical infrastructure necessary to support the Whittenton Electric Alternative would moderately affect the visual environment along the Whittenton Branch by introducing metal structures and wires into a residential environment. The overhead catenary system would include catenary supports at regular intervals, and electrical wires along the length of the line. The visual impact is anticipated to be minimal within the active segment of the line and within the portions of the inactive segment that pass through developed areas. The visual impact would be more substantial where the currently inactive segment passes through residential or undeveloped areas. The electrical infrastructure would be visible to adjacent residents and recreationists, but would be obscured from view from non-adjacent locations. Photographs of typical overhead catenary systems along another railroad are provided in Figure 3-31.

Visual and Aesthetic Impacts along the Attleboro Secondary Rail Segment

The Whittenton Electric Alternative includes 2.2 miles of single track reconstruction on the existing Attleboro Secondary with a 0.3-mile siding reserved for the proposed Dana Street Station. All of the existing at-grade road/railroad crossings would be reconfigured and/or improved to meet current safety standards. Grade crossings would be closed or consolidated whenever feasible. The freight service using the Attleboro Secondary is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would be constructed along the 2.2-mile length of the line shared by commuter trains. Potential direct impacts to visual and aesthetic resources resulting from constructing the upgraded rail lines and electrical infrastructure are described below.

One new train station would be constructed along this alignment in Taunton (Dana Street Station). No new layover facilities would be constructed along this segment. Potential direct impacts to visual and aesthetic resources from constructing and using the new station along the Attleboro Secondary are considered in the Stations section.

The relatively short, 2.2-mile Attleboro Secondary segment traverses downtown Taunton. Passengers would see the densely developed downtown area prior to reaching Weir Junction, where the Attleboro Secondary joins the New Bedford Main Line (described above).

Components of the Attleboro Secondary improvements for the Whittenton Electric Alternative that would potentially change the visual and aesthetic environment are:

- Railroad upgrades, including track, railroad bed, bridges, and culverts;
- At-grade crossing construction, including lights, gates, curbs, and painted signage for traffic control; and
- Electrical infrastructure construction, including overhead catenary system and traction power facilities.

Railroad upgrades minimally affect the visual environment along the Attleboro Secondary for passengers, occupants of adjoining properties, or passers-by. The upgraded track, railroad bed, bridges, and culverts would appear similar to the existing visual environment. For safety considerations, the right-of-way would be fenced where it passes through dense residential or downtown areas, presenting a minor visual impact by the addition of a chain-link fence to these environments.

Improving or reconfiguring the at-grade crossings would moderately affect the appearance of these areas. All existing grade crossings to remain and all reactivated crossings would be equipped with new, state-of-the-art Automatic Highway Crossing Warning (AHCW) systems. Each crossing would be supported by a minimum 8-foot by 8-foot aluminum shed that would house the AHCW system. The houses would be placed at the most advantageous quadrant of the crossing to not impede sight distance of pedestrians, motorists, and train engineers. Existing lights and gates would be replaced with new structures to improve safety; the new structures would be intentionally more visible than the existing lights and gates, for greater contrast with the existing visual environment. Ground level traffic controls (curbs and painted signage) are not expected to substantially alter the existing visual environment. The at-grade crossings would be visible principally to automobile drivers and passengers, as well as occupants of adjacent properties. The crossings would be only incidentally visible to train passengers. A photograph of a modern at-grade crossing on another railroad line is provided in Figure 4.5-30.

Constructing the electrical infrastructure necessary to support the Whittenton Alternative would also moderately affect the visual environment along the Attleboro Secondary by adding metal structures and wires to the existing railroad in a rural landscape. The overhead catenary system would include catenary supports at regular intervals, and electrical wires along the length of the line. The overhead catenary system would be visible to occupants of adjacent properties and motorists at crossing or paralleling locations. The electrical infrastructure would also be visible to residents of homes adjacent to the railroad, particularly near downtown Taunton. In segments where the visual environment is particularly sensitive, the catenary supports may be designed to a lower-profile appearance to minimize impacts to surrounding visual environment. Photographs of typical overhead catenary systems along another railroad are provided in Figure 3-31.

Figure 4.5-38 shows the proposed locations of the traction power facilities and Figure 4.5-32 provides photographs of existing similar facilities along another railroad line. One traction power facility, a paralleling station, would be constructed along the Attleboro Secondary for the Whittenton Electric Alternative. Paralleling stations typically require a 40-foot by 80-foot site. The paralleling station (PS-2) would be visible to train passengers, other users of the station, and occupants of adjacent commercial buildings, but would not substantially impact the visual environment of this developed area.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. As described above for the Stoughton Diesel Alternative, diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure, and therefore presents less of a visual impact. All other aspects of the Whittenton Diesel Alternative are the same as for the Whittenton Electric Alternative. Visual impacts would be limited to vegetation clearing and the grade crossing improvements.

Overall, the impacts to the visual environment from the Whittenton Diesel Alternative would be less than from the Whittenton Electric Alternative, due to the omission of electrical infrastructure along the Whittenton Branch.

Stations

This section provides basic descriptions of each train station, an indication of its appearance in reference to the existing visual environment, and a discussion about the visual impacts potentially resulting from constructing or reconstructing these stations for the South Coast Rail project.

Typically, the rail stations would consist of an 800-foot long platform to allow passengers to enter and exit the trains, a canopy on the platform, and parking lot. Some stations would not have dedicated parking lots (instead, they would share parking with other nearby facilities) and others would have parking structures rather than lots. Signage and safety lighting at the stations would be unobtrusive, but visible to passers-by and to some extent to occupants of adjacent properties. Variable message signs would be used, and downward-facing light hoods would be installed to minimize light pollution from safety lights. Typical details of side platform and center platform style stations are provided in Figures 4.5-39 and 4.5-40, respectively, for reference.

Battleship Cove Station

The Battleship Cove Station would use an existing developed area as a new train station that would serve all Build Alternatives. It would be located on Water Street in Fall River, near the southern terminus of the Fall River Secondary.

The Battleship Cove Station site was previously developed by the City for the Ponta Delgada Plaza. The station would be in a sparsely vegetated area at the rear of the plaza. The station would be visible from nearby higher elevation streets and similar-elevation industrial buildings and high-density residential areas.

A conceptual layout of this station is shown in Figure 4.5-41. The Battleship Cove Station would be a one side platform style (Figure 4.5-39). No parking lot is planned for this facility. The station would minimally affect the visual environment by replacing the existing vegetated area at the plaza with a new canopy and platform. The station would be visible to users, passers-by, and occupants of nearby buildings. Its appearance would be in keeping with the surrounding developed visual environment and monument. MassHighways has roadway improvement plans for Broadway south of the Battleship Cove Station, which include the construction of an on-/off-ramp from Broadway to Water Street, passing directly above the proposed track, just west of the rail platform. The MassDOT improvements would be visible from Battleship Cove station and impact the visual environment of station users.

Canton Center Station

The Canton Center Station is an existing train station along the Stoughton Line that would serve all Build Alternatives. It is located at 710 Washington Street in Canton. This station would be modified to accommodate a second track. A conceptual layout of the station is provided in Figure 4.5-42. Two new 800-foot long low-level platforms with mini-high platforms would be constructed (one adjacent to each track). Modifications to the tracks and platforms would require minor changes to the parking layout in the existing lots near the station, and no adjustments to the amount of existing parking spaces would be expected. Minor impacts to the visual environment would result from reconstructing the Canton Center Station.

Dana Street Station (Whittenton Alternatives)

The Dana Street Station would be a new station along the Attleboro Secondary that would serve only the Whittenton Alternatives. The station would be located west of Dana Street, just south of the Danforth Street grade crossing and within walking distance of downtown Taunton. The site is a previously developed, currently vacant parcel surrounded by dense development including commercial, industrial, and residential uses. It is visible from Danforth Road to the west. The residential developments west of Danforth Road do not have direct or unobstructed views into the site due to vegetation screening and the orientation of the residential development. The station site is partially visible from Dana Street to the north. However this area is vacant. No public views would be available into the Dana Street station from the south, as this area is occupied by an existing rail line. Public views into the Dana Street from the east are not available as the parcel south of the station site is occupied by auto-related industrial land uses.

A conceptual layout of the station is provided in Figure 4.5-43. This station would be a one side platform style (Figure 4.5-39). The visual environment would be affected by replacing the existing vacant lot with a new parking lot, sidewalk, canopy and platform. The station would be visible to users and passers-by. Its appearance would be in keeping with the existing developed visual environment. Impacts to the visual environment in the vicinity of the Dana Street Station would be minimal.

Easton Village Station

The Easton Village Station would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. The Easton Village Station site is on Sullivan Avenue at the transition point to Mechanic Street (near the intersection with Pond Street) in Easton.

The Easton Village Station site is a partially developed parcel surrounded by industrial and residential development. The site is in developed downtown Easton, adjacent to a historic train station and small parking area. The site is visible only from adjacent roads and properties.

A conceptual layout of this station is shown in Figure 4.5-44. The Easton Village Station would be a side platform style (Figure 4.5-39). The station would be a new structure consisting of a canopy, pedestrian ramp, and high-level platform on the west side of the tracks. A passenger drop-off location would be provided at the historic train depot parking lot east of the tracks, with pedestrian access to the station via an existing underpass at Pond Street. Standard parking facilities would not be included at this station. The station would be visible to users, passers-by, and occupants of nearby buildings.

As described above, the Stoughton Line right-of-way would be fenced where it passes through dense residential or downtown areas, presenting a visual impact by the addition of a chain-link fence to these environments. For the Easton Village Station, the fencing would be proximate to the historic district and historic train depot, altering the visual character of this area.

Adverse impacts to the visual environment in the vicinity of the new Easton Village Station would be substantial.

Fall River Depot Station

The Fall River Depot Station would be a new train station constructed along the Fall River Secondary to serve all Build Alternatives. It would be located near the intersection of North Davol Street and Pearce Street in Fall River.

The Fall River Depot Station site is a previously developed site surrounded by commercial and industrial development. Numerous commercial/industrial buildings in poor to fair visual condition are present on-site. The existing parking lots are also in poor condition. This site is visible from adjacent roads and nearby properties.

A conceptual layout of this station is shown in Figure 4.5-45. The Fall River Depot Station would be a side platform style (Figure 4.5-39). The station would favorably affect the visual environment by replacing the existing vacant commercial buildings and parking lot with a new canopy, platform, and parking deck. The station would be visible to users, passers-by, and occupants of nearby buildings. Its appearance would be an improvement compared to the existing vacant buildings and parking lots. Impacts to the visual environment in the vicinity of the Fall River Depot Station would be moderately beneficial.

Freetown Station

The Freetown Station would be a new train station constructed along the Fall River Secondary to serve all Build Alternatives. It would be located along South Main Street in Freetown. The Freetown Station site is behind a self-storage facility with associated parking; immediately adjacent properties are open land and forest. A cellular phone tower site is also adjacent. Low-density residential development is nearby. The self-storage facility contains four buildings in fair visual condition, and can be viewed from adjacent roads and residences. The self-storage facility and cell tower would remain at the site.

A conceptual layout of this station is included as Figure 4.5-46. The Freetown Station would be a side platform style (Figure 4.5-39). The station would affect the visual environment by adding a new access road, canopy, platform, and parking lot north and east of the existing self-storage facility. A bus drop-off loop would be included at this location. The station would be partially visible to users, passers-by, and occupants of nearby buildings, although off-site views would be obstructed by the existing buildings and surrounding vegetation. Impacts to the visual environment in the vicinity of the Freetown Station would be minimal.

King's Highway Station

The King's Highway Station would be a new train station constructed along the New Bedford Main Line to serve all Build Alternatives. It would be located near the intersection of King's Highway and Tarkiln Hill Road in New Bedford.

The King's Highway Station site is along the railroad right-of-way behind the King's Highway Plaza, a traditional strip mall (commercial development). The site is visible from adjacent roads and some of the commercial buildings. The existing retail establishments are in a variety of sizes and visual conditions.

Figure 4.5-47 shows the conceptual layout of this station. The King's Highway Station would be a side platform style (Figure 4.5-39). The station would affect the visual environment by adding a new canopy and platform. Parking would be shared with the existing, surrounding commercial businesses. The station would be partially visible to users, passers-by, and occupants of adjacent buildings. Its

appearance would be in keeping with the nearby developed visual environment. Impacts to the visual environment in the vicinity of the King's Highway Station would be minimal.

North Easton Station

The North Easton Station would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. It would be located at 21 Washington Street in Stoughton.

The North Easton Station site is an undeveloped parcel surrounded by commercial development and undeveloped land. The site is behind (west of) the Roche Brothers Shopping Plaza, with forested land and medical buildings also adjacent. The shopping plaza buildings and medical building are all in excellent visual condition. The site is not visible from adjacent roads or the shopping plaza, but is visible from the medical buildings. The perspective from the medical buildings would be from above, as the station would be at a much lower elevation.

A conceptual layout of this station is shown in Figure 4.5-48. The North Easton Station would be a center platform style (Figure 4.5-40). The center platform would be accessed by a passenger crossover (pedestrian bridge and stairs), approximately 23 feet tall. The station would affect the visual environment by replacing the existing vacant lot with a new canopy, platform, and parking lot. The station would be visible to users and occupants of the adjacent medical building, but not to passers-by on Route 138. Impacts to the visual environment in the vicinity of the North Easton Station would be minimal.

Raynham Park Station

The Raynham Park Station would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. It would be located at 1958 Broadway in Raynham, adjacent to the Raynham-Taunton Greyhound Park off of Route 138, which is currently operated as a simulcast betting location.

The Raynham Park site is a developed parcel that is a portion of surrounding recreational and industrial development; access to adjacent industrial facilities would be incorporated in the station design. Existing structures are in fair visual condition. Other nearby land is undeveloped. The site is not visible from nearby public roads, but is visible from other portions of the existing business.

A conceptual layout of this station is shown in Figure 4.5-49. The Raynham Park Station would be a center platform style (Figure 4.5-40) accessed by a passenger crossover (pedestrian bridge and stairs) approximately 23 feet tall. The station would favorably affect the visual environment by replacing some of the existing parking lot and development with a new canopy, platform, and parking lot. The station would be visible to users and occupants of the adjacent buildings, but not to passers-by on Route 138. Its appearance would be an improvement over the nearby developed visual environment, but would be in contrast to nearby undeveloped land. Impacts to the visual environment in the vicinity of the Raynham Park Station would be minimal.

Stoughton Station

The Stoughton Station would be a new train station constructed along the Stoughton Line, west of the existing railroad tracks and north of Brock Street, which would serve all Build Alternatives. In order to

accommodate a second track, the existing Stoughton station would be shifted from its present location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing.

A conceptual layout of this station is shown in Figure 4.5-50. The station design type would be a two side platforms (an inbound and outbound platform), each with a canopy, connected by a vertical circulation pedestrian bridge approximately 23 feet tall. The station would be visible from the rear of businesses along Washington Street (Route 138) and Morton Street, and from the rear of approximately five residences along Morton Street and Brock Street. Views of the station from other residences along Morton Street would be screened by trees. The primary view of the station would be from Brock Street at the station driveway. Its appearance would be in keeping with the surrounding visual environment, and impacts to the visual environment would be minimal.

Taunton Station (Stoughton Alternatives)

The Taunton Station would be a new train station constructed along the Stoughton Line that would only serve the Stoughton Alternatives. It would be located near the intersection of East Arlington Street and William Hooke Lane in Taunton.

The Taunton Station site is a previously developed parcel surrounded by commercial development. This location is near a former (historic) train station. The site currently contains vacant buildings and other derelict areas as a result of fire; all are in poor visual condition. The site is visible from nearby roads and residences, and partially visible from sports fields on the opposite (east) side of the tracks.

A conceptual layout of this station is shown in Figure 4.5-51. The Taunton Station would be a side platform style (Figure 4.5-39). The station would favorably affect the visual environment by replacing the existing vacant and derelict structures with a new canopy, platform, and parking lot. The station would be visible to users, occupants of nearby properties, and passers-by. Impacts to the visual environment in the vicinity of the Taunton Station would be very beneficial.

Taunton Depot Station

The Taunton Depot Station (formerly referred to as East Taunton (North) Station) would be a new train station constructed along the New Bedford Main Line that would serve all Build Alternatives. It would be located at 872 County Street in Taunton, behind the existing Target plaza.

The Taunton Depot Station site is an undeveloped parcel adjacent to commercial development and undeveloped lands. Much of the site has been cleared of trees but is vegetated with shrubs and grasses. The adjacent shopping plaza contains numerous retail establishments and is in good visual condition. This site, at the rear of the shopping plaza, is not visible from nearby roadways or the plaza parking lot or stores, and is not visible from other sides due to the forest cover.

A conceptual layout of this station is shown in Figure 4.5-52. The Taunton Depot Station would be a center platform style (Figure 4.5-40). The station would replace the existing vacant lot with a new canopy, platform, and parking lot. The center platform would be accessed by a passenger crossover (pedestrian bridge and stairs), approximately 23 feet tall. The station would be visible to users but generally not to passers-by or other building occupants because of lack of vantage points. Only minor impacts to the visual environment would result from constructing the Taunton Depot Station.

Whale's Tooth Station

The Whale's Tooth Station would be a new train station constructed along the New Bedford Main Line constructed to serve all Build Alternatives. It would be located near the intersection of Acushnet Avenue and Hillman Street, near the southern terminus of the New Bedford Main Line.

The Whale's Tooth Station site is at an existing parking lot surrounded by industrial development. The site is visible from adjacent roads and properties, as well as nearby residences at higher elevations.

A conceptual layout of this station is shown in Figure 4.5-53. The Whale's Tooth Station would be a side platform style (Figure 4.5-39). The station would minimally affect the visual environment with a new canopy and platform constructed at the existing parking lot. The lot would be modified to include accessible spaces near the station platform, a pick-up/drop off area for buses and kiss & ride, and to provide better connections to Acushnet Avenue. The station would be visible to users, occupants of nearby properties, and passers-by. Its appearance would be in keeping with the surrounding developed visual environment. Impacts to the visual environment in the vicinity of the Whale's Tooth Station would be minimal.

Layover Facilities

The Build Alternatives would require midday storage in the Boston area. The mid-day train layover facility is being investigated separately as part of the South Station Expansion Project. Two train layover facilities are planned for the Southern Triangle: one each at or near the end of the Fall River Secondary and the New Bedford Main Line. Three alternative sites were identified for the Fall River Secondary, and two alternative sites were identified for the New Bedford Main Line. The Weaver's Cove East site was selected as the preferred layover facility site for the Fall River Secondary and the Wamsutta site was selected as the preferred layover facility site for the for the New Bedford Line. This section provides basic descriptions of each layover facility site, an indication of its location in reference to the existing visual environment, and a discussion about the visual impacts potentially resulting from constructing these facilities for the South Coast Rail project.

Layover facility plans are conceptual at this point, consisting only of general layouts and footprints. Tracks at the train layover facilities would diverge from the respective through lines (Fall River Secondary, or New Bedford Main Line) and consist of a series of short parallel spurs upon which trains would be parked for overnight layovers and light maintenance work. Parking areas for employees would be included within the facilities, and hooded lights would minimize light pollution. Small site structures are planned for storage and personnel change rooms. The facilities would be fenced and lighted for security. Engineering plans will be completed for these facilities once the LEDPA has been determined.

Wamsutta Layover Facility

The Wamsutta site layover facility would be constructed along the New Bedford Main Line and would serve all rail alternatives. It would be located in New Bedford near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main Line, just north of the Whale's Tooth Station.

The Wamsutta site is a previously developed site, currently used as a rail yard for CSX, within an industrial area. The site is visible from adjacent roads and buildings. Adjoining properties are transportation corridors or industrial in nature. Industrial sites are located north, east, and south of this

location, and Route 18 to the west. No commercial or residential properties, or open spaces, are located in close proximity to this site. A conceptual layout of a layover facility at the Wamsutta site is shown in Figure 4.5-54.

The Wamsutta site layover facility would minimally affect the visual character of this developed area, continuing its railroad use. The facility would be visible to occupants of nearby properties and passers-by. Its appearance would be in keeping with the surrounding industrial developed visual environment. The proposed new layover facility would not appreciably alter the visual environment given that the site is in an industrial setting partially occupied by an existing rail yard.

Weaver's Cove East Layover Facility

The Weaver's Cove East site layover facility would be constructed along the Fall River Secondary and would serve all rail alternatives. It would be located in Fall River west of Main Street between the existing Fall River Secondary and Main Street, approximately 2.5 miles from the southern terminus of the Fall River Secondary.

The proposed Weaver's Cove East layover facility site is an undeveloped parcel adjoining an abandoned industrial facility and across a primary surface street from a residential neighborhood. Currently vacant land, a portion of the Weaver's Cove East site was previously developed. Approximately one-half of the site is cleared of vegetation or includes remnant building foundations; the remainder of the site is vegetated. Surrounding land to the north, east, and south is residential; industrial land use is present to the southwest. Undeveloped land is immediately west of the site, adjoining the Taunton River. The industrial site to the southwest is a former Shell Oil facility, and consists of completely cleared land with several large aboveground storage tanks and a short shipping dock. The layover facility site is visible from the adjacent residential properties. The layover facility would also be visible from the Taunton River, but partially obscured from view by vegetation. As described above, this segment of the Taunton River has been designated as a "recreational river area," recognizing its aesthetic value and developed shoreline. A conceptual layout of a layover facility at the Weaver's Cove East site is shown in Figure 4.5-55.

The visual environment of the recreational river area would be permanently altered by the new layover facility, but the visual character of this partially developed shoreline would not be adversely affected. The facility construction activities would temporarily adversely impact the visual character of the river in this segment.

The Weaver's Cove East site layover facility would substantially affect the visual environment in this partially developed area. The facility would be visible to occupants of nearby properties and to passers-by on Main Street. The layover facility would be partially visible to passers-by on the Taunton River. Its appearance would be in keeping with the existing developed industrial visual environment but in contrast to adjacent residential and undeveloped land. It may adversely affect the visual setting of the North Main Street District of Fall River.

4.5.4 Summary of Impacts by Alternative

This section summarizes the direct effects to visual and aesthetic resources potentially resulting from implementing each of the South Coast Rail project alternatives, based upon conceptual engineering plans.

The individual components of each element are grouped by alternative, and the expected impacts to the surrounding visual environment are summarized based upon a qualitative assessment of the change in the visual character of the local environment that would result from each component combined with the actual visibility of those changes. The visual impacts of each element are rated as substantial, moderate, or minimal, based upon a qualitative generalization of how easily and frequently the changed visual environment may be seen by occupants of adjacent or nearby properties (including residences and businesses), recreationists on adjacent open space, or passers-by on sidewalks, roads, highways or water bodies. This evaluation does not take into consideration the perspective of passengers on the trains or buses.

4.5.4.1 Stoughton Electric Alternative

The Stoughton Electric Alternative (Figure 1.4-4) would be comprised of the elements listed in Table 4.5-1, which also summarizes the direct effects to visual and aesthetic resources potentially resulting from implementing this alternative.

In general, the Stoughton Electric Alternative presents moderate impacts to the visual environment. The visual impacts would vary locally and by individual component, but this alternative would use existing infrastructure (upgraded as necessary) only to a moderate degree. Where existing infrastructure is used, most impacts to the visual environment would be incremental additions to an existing, disturbed landscape with active rail use. The out-of-service portion of the Stoughton Line segment, from the Stoughton Station south to Weir Junction, would require railroad reconstruction and new electrical infrastructure construction with attendant substantial impacts to the visual environment. Vegetation removal would change the visual character for residential neighborhoods and open spaces along this portion of the Stoughton Line. In some portions of this segment, and at some of the station sites, the visual impact is partially offset by the low visibility of these sites, in somewhat remote locations, to the general public. The visual character in the vicinity of the historic district in Easton would be substantially affected by the re-established train service and new Easton Village Station.

Table 4.5-1 Summary of Potential Direct Effects to Visual and Aesthetic Resources from the Stoughton Electric Alternative

Element/Component	Change in Visual Environment	Visual Impact
Railroad Alignments		
Northeast Corridor	No new construction	None
Stoughton Line	Track, crossing, and electrical infrastructure upgrades in active, disturbed environment and new track, trestle, crossing, and electrical infrastructure construction in out-of-service railroad corridor, including urban and rural settings, and four crossings of a designated "Wild and Scenic River" with overhead catenary system	Moderate to Substantial
Fall River Secondary	Track and crossing upgrades, and electrical infrastructure construction in active, disturbed environment including rural and urban settings, and one crossing of a designated "Wild and Scenic River" with overhead catenary system	Moderate
New Bedford Main Line	Track and crossing upgrades, and electrical infrastructure construction in active, disturbed environment including rural and urban settings	Moderate
Stations		
Canton Center	Station reconstruction in developed area	Minimal
Stoughton	New station construction in developed area	Minimal
North Easton	New station construction in partially developed/ undeveloped area	Minimal
Easton Village	New station construction in partially developed/ undeveloped area	Substantial
Raynham Park	New station construction in developed area	Minimal
Taunton	New station construction in developed area	Moderate (beneficial)
Taunton Depot	New station construction in partially developed/ undeveloped area	Minimal
Freetown	New station construction in partially developed/ undeveloped area	Minimal
Fall River Depot	New station construction in developed area	Moderate (beneficial)
Battleship Cove	New station construction in developed area	Minimal
King's Highway	New station construction in developed area	Minimal
Whale's Tooth	New station construction in developed area	Minimal
Layover Facility Alternatives		
Wamsutta Site	New facility construction in developed area	Minimal
Weaver's Cove East Site	New facility construction in partially developed area, including designated "Wild and Scenic River"	Moderate

4.5.4.2 Stoughton Diesel Alternative

The Stoughton Diesel Alternative would be comprised of the same elements as the Stoughton Electric Alternative (shown in Figure 1.4-4) as listed above but would not need electrical infrastructure. Specifically, the metal structures and wires associated with the overhead catenary system, and the traction power facilities, would not be constructed as part of this alternative. Table 4.5-2 summarizes the direct effects to visual and aesthetic resources potentially resulting from implementing this alternative.

In general, the Stoughton Diesel Alternative also presents moderate impacts to the visual environment, but less of an impact than the electric alternative because there would not be electric infrastructure along the alignment. As with the Stoughton Electric Alternative, the visual impacts would vary locally

and by individual component. Where existing infrastructure is used, most impacts to the visual environment would be incremental additions to an existing, disturbed landscape with active rail use. The out-of-service portion of the Stoughton Line segment, from the Stoughton Station south to Weir Junction, would require significant railroad reconstruction with attendant significant impacts to the visual environment. Vegetation removal would change the visual character for residential neighborhoods and open spaces along this portion. In some portions of this segment, and at some of the station sites, the visual impact is partially offset by the low visibility of these sites, in somewhat remote locations, to the general public. The visual character in the vicinity of the historic district in Easton would be substantially affected by the re-established train service and new Easton Village Station.

Table 4.5-2 Summary of Potential Direct Effects to Visual and Aesthetic Resources from the Stoughton Diesel Alternative

Element/Component	Change in Visual Environment	Visual Impact
Railroad Alignments		
Northeast Corridor	No new construction	None
Stoughton Line	Track and crossing upgrades in active, disturbed environment and new track, trestle and crossing construction in out-of-service railroad corridor, including urban and rural settings, and four crossings of a designated "Wild and Scenic River"	Minimal to Substantial
Fall River Secondary	Track and crossing upgrades in active, disturbed environment including rural and urban settings, and one crossing of a designated "Wild and Scenic River"	Minimal
New Bedford Main Line	Track and crossing upgrades in active, disturbed environment including rural and urban settings	Minimal
Stations		
Canton Center	Station reconstruction in developed area	Minimal
Stoughton	New station construction in developed area	Minimal
North Easton	New station construction in partially developed/ undeveloped area	Minimal
Easton Village	New station construction in partially developed/ undeveloped area	Substantial
Raynham Park	New station construction in developed area	Minimal
Taunton	New station construction in developed area	Moderate (beneficial)
Taunton Depot	New station construction in partially developed/ undeveloped area	Minimal
Freetown	New station construction in partially developed/ undeveloped area	Minimal
Fall River Depot	New station construction in developed area	Moderate (beneficial)
Battleship Cove	New station construction in developed area	Minimal
Stations		
King's Highway	New station construction in developed area	Minimal
Whale's Tooth	New station construction in developed area	Minimal
Layover Facility Alternatives		
Wamsutta Site	New facility construction in developed area	Minimal
Weaver's Cove East Site	New facility construction in partially developed area, including designated "Wild and Scenic River"	Moderate

No new electrical infrastructure construction (overhead catenary system and traction power facilities) would be needed. This reduces the overall visual impact of the Stoughton Diesel Alternative as compared to the Stoughton Electric Alternative.

4.5.4.3 Whittenton Electric Alternative

The Whittenton Electric Alternative would be comprised of the elements listed in Table 4.5 3, which also summarizes the direct effects to visual and aesthetic resources potentially resulting from implementing this alternative.

Table 4.5-3 Summary of Potential Direct Effects to Visual and Aesthetic Resources from the Whittenton Electric Alternative

Element/Component	Change in Visual Environment	Visual Impact
Railroad Alignments		
Northeast Corridor	No new construction	None
Stoughton Line	Track, crossing, and electrical infrastructure upgrades in active, disturbed environment and new track, trestle, crossing, and electrical infrastructure construction in out-of-service railroad corridor, including urban and rural settings	Moderate to Substantial
Whittenton Branch	New track, crossing, and electrical infrastructure construction in out-of-service railroad corridor, including urban and rural settings	Moderate
Attleboro Secondary	Track and crossing upgrades, and electrical infrastructure construction in active, disturbed environment including rural and urban settings	Moderate
Fall River Secondary	Track and crossing upgrades, and electrical infrastructure construction in active, disturbed environment including rural and urban settings, and one crossing of a designated “Wild and Scenic River” with overhead catenary system	Moderate
New Bedford Main Line	Track and crossing upgrades, and electrical infrastructure construction in active, disturbed environment including rural and urban settings	Moderate
Stations		
Canton Center	Station reconstruction in developed area	Minimal
Stoughton	New station construction in developed area	Minimal
North Easton	New station construction in partially developed/ undeveloped area	Minimal
Easton Village	New station construction in partially developed/ undeveloped area	Substantial
Raynham Park	New station construction in developed area	Minimal
Dana Street	New station construction in developed area	Minimal
Taunton Depot	New station construction in partially developed/ undeveloped area	Minimal
Freetown	New station construction in partially developed/ undeveloped area	Minimal
Fall River Depot	New station construction in developed area	Moderate (beneficial)
Battleship Cove	New station construction in developed area	Minimal
King’s Highway	New station construction in developed area	Minimal
Whale’s Tooth	New station construction in developed area	Minimal
Layover Facility Alternatives		
Wamsutta Site	New facility construction in developed area	Minimal
Weaver’s Cove East Site	New facility construction in partially developed area, including designated “Wild and Scenic River”	Moderate

In general, the Whittenton Electric Alternative presents a moderate impact to the visual environment. As with the Stoughton Electric Alternative, the visual impacts would vary locally and by individual component, but this alternative would use existing infrastructure (upgraded as necessary) only to a moderate degree. Where existing infrastructure is used, most impacts to the visual environment would be incremental additions to an existing, disturbed landscape with active rail use. The out-of-service portion of the Stoughton Line and Whittenton Branch segments, from the Stoughton Station south to Raynham Junction and on to Whittenton Junction, would require railroad reconstruction and new electrical infrastructure construction with attendant significant impacts to the visual environment.

Vegetation removal would change the visual character for residential neighborhoods and open spaces along this portion. In some portions of this segment, and at some of the station sites, the visual impact is partially offset by the low visibility of these sites, in somewhat remote locations, to the general public. The visual character in the vicinity of the historic district in Easton would be substantially affected by the re-established train service and new Easton Village Station.

4.5.4.4 Whittenton Diesel Alternative

The Whittenton Diesel Alternative would be comprised of the same elements as the Whittenton Electric Alternative as listed above but would not need electrical infrastructure. Specifically, the metal structures and wires associated with the overhead catenary system, and the traction power facilities, would not be constructed as part of this alternative. Table 4.5-4 summarizes the direct effects to visual and aesthetic resources potentially resulting from implementing this alternative.

In general, the Whittenton Diesel Alternative also presents a moderate impact to the visual environment, but less of an impact than the electric alternative because there would not be electric infrastructure along the alignment. As with the Stoughton Diesel Alternative, the visual impacts would vary locally and by individual component. Where existing infrastructure is used, most impacts to the visual environment would be incremental additions to an existing, disturbed landscape with active rail use. The out-of-service portion of the Stoughton Line and Whittenton Branch segments, from the Stoughton Station south to Raynham Junction and on to Whittenton Junction, would require railroad reconstruction with attendant significant impacts to the visual environment. Vegetation removal would change the visual character for residential neighborhoods and open spaces along this portion. In some portions of this segment, and at some of the station sites, the visual impact is partially offset by the low visibility of these sites, in somewhat remote locations, to the general public. The visual character in the vicinity of the historic district in Easton would be substantially affected by the re-established train service and new Easton Village Station.

No new electrical infrastructure construction (overhead catenary system and traction power facilities) would be needed. This reduces the overall visual impact of the Whittenton Diesel Alternative as compared to the Whittenton Electric Alternative.

Table 4.5-4 Summary of Potential Direct Effects to Visual and Aesthetic Resources from the Whittenton Diesel Alternative

Element/Component	Change in Visual Environment	Visual Impact
Railroad Alignments		
Northeast Corridor	No new construction	None
Stoughton Line	Track and crossing upgrades in active, disturbed environment and new track, trestle, and crossing construction in out-of-service railroad corridor, including urban and rural settings	Moderate to Substantial
Whittenton Branch	New track and crossing construction in out-of-service railroad corridor, including urban and rural settings	Moderate
Attleboro Secondary	Track and crossing upgrades in active, disturbed environment including rural and urban settings	Minimal
Fall River Secondary	Track and crossing upgrades in active, disturbed environment including rural and urban settings, and one crossing of a designated “Wild and Scenic River”	Minimal
New Bedford Main Line	Track and crossing upgrades in active, disturbed environment including rural and urban settings	Minimal
Stations		
Canton Center	Station reconstruction in developed area	Minimal
Stoughton	New station construction in developed area	Minimal
North Easton	New station construction in partially developed/ undeveloped area	Minimal
Easton Village	New station construction in partially developed/ undeveloped area	Substantial
Raynham Park	New station construction in developed area	Minimal
Dana Street	New station construction in developed area	Minimal
Taunton Depot	New station construction in partially developed/ undeveloped area	Minimal
Freetown	New station construction in partially developed/ undeveloped area	Minimal
Fall River Depot	New station construction in developed area	Moderate (beneficial)
Battleship Cove	New station construction in developed area	Minimal
King’s Highway	New station construction in developed area	Minimal
Whale’s Tooth	New station construction in developed area	Minimal
Layover Facility Alternatives		
Wamsutta Site	New facility construction in developed area	Minimal
Weaver’s Cove East Site	New facility construction in partially developed area, including designated “Wild and Scenic River”	Moderate

4.5.4.5 Summary of Impacts

The overall impacts to visual and aesthetic resources resulting from improving or constructing the Build Alternatives would not vary considerably between the alternative alignments. Although all alternatives are rated with an overall moderate visual impact, each alternative alignment has at least one element with a substantial visual impact at the local level. The Stoughton and Whittenton Alternatives would substantially impact the visual environment at the historic Easton train station and in currently out-of-service segments of the Stoughton Line and Whittenton Branch for some 15 miles. Public views of the proposed 1.6-mile trestle would be limited throughout the Hockomock Swamp wildlife management area and will have a visual impact; however there is limited public access to this area. Electric alternatives would have higher visual impacts than diesel alternatives due to the electrical infrastructure requirements.

4.5.5 Mitigation

4.5.5.1 Introduction

This section summarizes the mitigation measures that may be taken to minimize the visual impact resulting from the South Coast Rail project alternatives.

4.5.5.2 Potential Mitigation Measures

Generally, mitigation is appropriate where facilities are most visible and present a change to the existing visual environment, but are not outweighed by safety considerations. Mitigating impacts to the visual environment generally involves screening a facility or structure, or blending its design with the surrounding environment.

The project has the potential to alter the aesthetics of certain properties and districts where new stations, parking lots, or crossings are proposed. While the original construction of any of the railroads in the mid-1800s may have been consistent with the aesthetic nature of the communities at that time, reactivating the rail lines using modern materials and safety standards may result in undesirable changes in the visual environment. Screening certain structures and safety and signal equipment may mitigate these impacts. Potential screening techniques include the combination of wooden and opaque chain link fencing with landscape plantings.

The proposed visual mitigation measures include siting and designing facilities to minimize changes to the visual landscape, and minimizing vegetation removal along the right-of-way. Mitigation measures such as screening and light minimization would be incorporated during preliminary or final design. The specific mitigation measures proposed for visual impacts are listed in Table 4.5-5 and the following subsections outline these approaches for each element of the alternatives.

Table 4.5-5 Proposed Mitigation Measures for Potential Impacts to Visual and Aesthetic Resources

Potential Mitigation Measure	Implementation Schedule
Install screening in selected locations	During construction
Select station lighting fixtures, designs, and technologies that minimize night sky impacts	During design
Install station lighting that minimizes night-sky impacts	During construction
Design facilities and structures to blend with the surrounding landscape	During design

Screening

Facilities or structures may be screened from view by natural or man-made barriers. Typically, the choice of a screening method is based upon the surrounding environment: natural visual barriers, such as vegetation screens, are best suited to natural environments. Physical placement of the facilities, removed from view by the majority of the general public, can also function as a form of screening. Man-made barriers, such as walls or fences, function well in a built environment. Vegetation may also be suitable within the built environment if the surrounding properties include landscaping elements.

Unnecessary clear-cutting of trees and vegetation along the railroad rights-of-way that would have an adverse visual impact on residential properties or open spaces would be avoided. Existing trees and

vegetative screening would be retained to visually buffer properties from the rail lines to the extent feasible and with due regard for public safety, operational requirements, cost, and maintenance considerations.

Screening is most applicable for facilities with a vertical component, such as stations and electrical infrastructure, as compared to the railroad track itself. Although the stations must be placed along the railroad or highway alignments, their locations along those alignments have often been chosen to minimize the visual impact by siting behind existing structures or remote from passers-by. Remote locations for traction power facilities have similarly been chosen, and these facilities can be further screened from passengers' view by vegetation or other screening. The overhead catenary systems, however, cannot be screened from view except by the unrelated routing of the railroad line in remote locations.

Design

Facilities or structures may also be designed to blend with the surrounding visual environment. This can be accomplished by designing architecturally consistent or unobtrusive structures. For example, the proposed replacement bridges over segments of the Taunton River that are designated as "scenic" or "recreational" river areas are envisioned as architecturally consistent with the existing bridges and visual environment. Station platforms and weather shelters, on the other hand, are unobtrusive structures that fit well in most built environments. Facilities proposed for industrial locations, such as the Wamsutta and Church Street site layover facilities, would blend well with the surrounding visual environment due to the appearance of the nearby industrial facilities.

Where prudent, equipment including traffic signals and controller cabinets, street lights, street furniture, overhead catenary system poles, and railroad signal equipment housings would be dark colored to reduce the visual impact of this equipment. Special design of a low visual impact overhead catenary system would be considered where appropriate. Traffic signals and street lights would be ornamental type in accordance with the towns' preferences to the extent reasonably possible, and would feature downward-facing hoods to minimize light pollution.

4.5.5.3 Summary

Screening and design methods could successfully reduce and mitigate some potential visual impacts to properties associated with the reactivation of any of the historic railroads for the South Coast Rail project. Impacts would be minimized by siting the power substations and stations where they would reduce changes to the visual landscape, and lighting has been selected to minimize night-sky impacts. However, visual impacts cannot be completely avoided for any alternative.

Additional mitigation measures will be explored in the final design, for the LEDPA.

4.5.6 Regulatory Compliance

This section outlines the regulatory compliance requirements for visual and aesthetic resources. These resources are indirectly regulated at the federal or state levels, and are usually considered in NEPA or MEPA analyses. Compliance with the National Historic Preservation Act typically includes assessment of the visual context of a cultural resource, as discussed separately in Chapter 4.8, *Cultural Resources*. The only other applicable federal law with specific reference to visual resources is the Wild and Scenic Rivers Act. As discussed in the section on the Southern Triangle, the Taunton River was recently included in the Wild and Scenic River Program.

4.5.6.1 Wild and Scenic Rivers Act

Section 2(b) of the 1968 Wild & Scenic Rivers Act specifies that river segments may be classified, designated, and administered as wild river areas, scenic river areas, or recreational river areas. These determinations are based essentially on the degree of naturalness and access to the river. The Act is administrated by the U.S. Department of the Interior (USDOI National Park Service), except on U.S. Department of Agriculture (USDA) Forest Service properties, which are administered by the Forest Service. The National Park Service administrates the Wild and Scenic River Program generally, and the Forest Service administrates the program within properties managed by that agency. The National Park Service refers to Forest Service regulations, published in 36 CFR, to implement the Act and is the lead agency for this program as it relates to the South Coast Rail project's potential impacts to visual resources along the Taunton River. On March 30, 2009, segments of the Taunton River were designated as "scenic" or "recreational" river areas under the Wild and Scenic Rivers Act; on that date, the segment along the Fall River Secondary and the segment through Taunton from Weir Street to Route 24 were designated as a "recreational river area," which is defined by the Act as a segment with a partially developed shoreline and ready access.

Consultation

USDA implementing regulations, at 36 CFR 297.4, state that "[n]o license, permit, or other authorization can be issued for a Federally assisted water resources project on any portion of a Wild and Scenic River or Study River nor can appropriations be requested to begin construction of such projects, without prior notice to the Secretary of Agriculture, and a determination in accordance with section 7 of the Act."

Additionally, "[f]ederal assistance means… a license, permit, or other authorization granted by the ACOE pursuant to the Rivers and Harbors Act and section 404 of the Clean Water Act" (36 CFR 297.3).

Finally, "[t]he Secretary of Agriculture will consent to the issuance of any Federal license, permit, or other authorization if, as a finding of fact, it is determined that: (1) the water resources project will not have a direct and adverse effect on the values for which a Wild and Scenic River or Study River was designated, when any portion of the project is within the boundaries of said river, or; (2) the effects of the water resources project will neither invade nor unreasonably diminish the scenic, recreational, and fish or wildlife values of a Wild and Scenic River, when any portion of the project is located above, below, or outside the Wild and Scenic River… if consent is denied, the Secretary may recommend measure to eliminate adverse effects, and the authorizing agencies may submit revised plans for consideration" (36 CFR 297.5).

A Clean Water Act Section 404 permit is required for discharge of fill material incidental to bridge construction if the piers, supports or other infrastructure for such bridge are proposed to be placed in waters of the United States. These conditions apply to construction of replacement bridges over the Taunton River and the layover facilities adjacent to the river, which therefore would require a Clean Water Act Section 404 permit. Consultation with the National Park Service would be necessary to obtain the Secretary of Agriculture's concurrence that the effects of the South Coast Rail project on the recreational values of the Taunton River would be neither invaded nor unreasonably diminished.

The following sections summarize the applicability of this consultation requirement for each South Coast Rail alternative.

Stoughton Alternatives

The Stoughton Alternatives also include the New Bedford Main Line, which crosses the Taunton River just south of Weir Junction. The Stoughton Line also crosses the Taunton River at three locations north of Weir Junction, as well as a tributary to the Taunton River (the Mill River) within 0.25 mile of the Taunton River's main stem. Bridge replacement at all of these locations, as described in the Southern Triangle and Stoughton Electric Alternative sections, would affect the visual environment of the Taunton River as regulated by the National Park Service under the Wild and Scenic Rivers Act. The layover facility site along the Fall River Secondary (Weaver's Cove East) also would affect the visual environment of the Taunton River. The National Park Service was contacted for consultation. A meeting between MassDOT and representatives from the NPS Wild and Scenic Rivers Program was held in January 2012 to discuss the status of Taunton River as a National Wild and Scenic River. Detailed descriptions of the South Coast Rail project's potential impacts to the Taunton River from the proposed bridge replacement and Fall River Depot Station were requested. These are described above in Section 4.5.3.3 in the context of visual resources, and are also summarized in Chapter 4.10, *Open Space*. This chapter also provides information regarding the layover facility along the Fall River Secondary. Further consultation with NPS is anticipated as the project advances through the design process.

Whittenton Alternatives

The Whittenton Alternatives also include the New Bedford Main Line, which crosses the Taunton River just south of Weir Junction. These alternatives, however, follow the Attleboro Secondary for a brief distance north of Weir Junction, bypassing the Taunton River crossings of the Stoughton Alternatives. Bridge replacement at the single New Bedford Main Line crossing (described in the Southern Triangle section) would affect the visual environment of the Taunton River as regulated by the National Park Service under the Wild and Scenic Rivers Act. The Weaver's Cover East layover facility site along the Fall River Secondary also would affect the visual environment of the Taunton River. The National Park Service has been contacted for consultation as described above for the Stoughton Alternative.

4.6 NOISE

4.6.1 Introduction

This chapter describes the noise analysis methodology, noise assessment criteria, existing noise levels, noise impacts and mitigation measures.

4.6.1.1 Resource Definition

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities, such as sleep, work, or recreation. Under extreme conditions sound can cause physical harm, such as hearing loss or adverse mental health effects. Although there are no specific state or federal statutes or regulations concerning transit noise, MEPA and NEPA require evaluating noise impacts as part of a proposed project's potential impacts on the human environment.

How people perceive sound depends on the following measurable physical characteristics of the sound.

- **Intensity**: Sound intensity is often equated to loudness. The sound level magnitude (typically measured in decibels [dB]) is a measure of sound intensity. A 10-decibel increase in intensity is generally perceived as a doubling in loudness.

- **Frequency Content**: Most common sounds are composed of acoustic energy distributed over a variety of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz (Hz). High-frequency (above 2,000 Hz) sound is typically considered more annoying than low-frequency (below 500 Hz) sound and may also be perceived as louder.

- **Temporal Pattern**: The temporal nature of sound includes factors such as continuity, fluctuation, impulsiveness, and intermittence. Sound with increasing intensity over time is often perceived as louder than sound with decreasing intensity. Impulsive and intermittent sounds are usually perceived as louder than the actual sound level.

Individual human response to noise is subject to considerable variability. There are many factors, both emotional and physical, that contribute to the variation in human reaction to noise. The existence of numerous emotional and physical variables prohibits defining an exact individual or community response for any given noise level. Community noise criteria are therefore based on statistical averages of human response to noise and applicable health criteria.

Sound levels are most often measured using decibels (dB). The dB scale is logarithmic and compresses the audible acoustic pressure levels, which can vary from 20 micropascals (µPa), the reference pressure and threshold of hearing (0 dB), to 20 million µPa, the threshold of pain (120 dB). Because the dB scale is logarithmic, the addition of two sound levels is not linear. To add sound levels in dB, the dB are converted into energy terms, which are then added and converted back to dB.

The human ear does not hear sound energy linearly (on a one-to-one basis); hence, humans do not perceive changes in sound level as equally loud. Research indicates that the following general relationships exist between sound level and human perception:

- A 3 dB increase is a doubling of acoustic energy. Studies have shown that 3 dB is the threshold for people to perceive a change in sound level. The average person will not be able to distinguish a 3 dB difference in sound level in a laboratory condition; and
- A 10 dB increase is a tenfold increase in acoustic energy but is perceived as a doubling in loudness to the average person. The average person will judge a 10 dB change in sound level to be twice or half as loud.

The human ear does not perceive sound levels from every frequency as equally loud. As part of the hearing process, the human ear will attenuate low and high-frequency sounds. To compensate for these phenomena in perception, the A-weighted decibel scale, referred to as dBA, is used to measure and evaluate environmental noise levels. The A-weighted scale adjusts sound pressure levels by frequency, reducing low and high-frequency sound, similar to the way people hear sound. All of the sound levels used to evaluate noise impacts associated with this project are in dBA. Table 4.6-1 illustrates the decibel levels for typical indoor and outdoor sound.

The most commonly used indicators for community noise surveys are the energy-averaged equivalent sound level (Leq) and the day-night averaged sound level (Ldn). This noise analysis uses Ldn and Leq sound levels to evaluate noise. The Leq and the Ldn are the most frequently used metrics in environmental noise analyses. Extensive federal research has concluded that the Leq and Ldn are the best metrics for determining annoyance (impact) to the human environment. The Ldn is currently the predominant noise metric used by most federal agencies, including the FTA, USEPA, Federal Aviation Administration, Department of Housing and Urban Development, and Department of Defense.

The Leq is the steady-state sound level, which in a given period of time (typically one hour) contains the same acoustic energy as the time-varying (fluctuating) sound level during that same period. The Leq averages the background sound levels with short-term transient sound levels. The background sound level does not include noise from transient events (such as aircraft over-flights) and typically fluctuates during the day, week, and year. The 1-hour average Leq is implied throughout this analysis when the term Leq is used. The Ldn noise indicator is a 24-hour average sound level that is derived from hourly Leq values with a 10 dBA penalty on sounds occurring at night (10pm to 7am). The peak hour Leq represents the noisiest hour of the day or night and usually occurs during the peak periods of automobile and truck traffic.

4.6.2 Existing Conditions

4.6.2.1 Methodology

The FTA Transit Noise and Vibration Impact Assessment Guidelines[1] were used to evaluate existing noise conditions. These guidelines specify criteria and define procedures to project transit noise exposure.

The FTA guidelines require that noise-sensitive locations within impact distances to the rail corridor be categorized into three types of noise-sensitive land uses. The three land use categories correlate land use with sensitivity to noise intrusions and reflect the various noise-sensitive land uses, which could be present along the proposed rail corridor. The land use categories are presented in Table 4.6-2.

[1] Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

Table 4.6-1 Typical Indoor and Outdoor Sound Levels

Outdoor Sound Levels	Sound Pressure[1] (μPa)	Sound Level[2] (dBA)	Indoor Sound Levels
Threshold of pain	20,000,000	120	
		115	
	6,324,555	110	Rock band at 5 meters (m)
Jet Over-Flight at 300 m		105	
	2,000,000	100	Inside New York subway train
Gas Lawn Mower at 1 m		95	
	632,456	90	Food blender at 1 m
Diesel Truck at 15 m		85	
Noisy Urban Area—Daytime	200,000	80	Garbage disposal at 1 m
		75	Shouting at 1 m
Gas Lawn Mower at 30 m	63,246	70	Vacuum cleaner at 3 m
Suburban Commercial Area		65	Normal speech at 1 m
	20,000	60	
Quiet Urban Area—Daytime		55	Quiet conversation at 1 m
	6,325	50	Dishwasher next room
Quiet Urban Area—Nighttime		45	
	2,000	40	Empty theater or library
Quiet Suburb—Nighttime		35	
	632	30	Quiet bedroom at night
Quiet Rural Area—Nighttime		25	Empty concert hall
Rustling Leaves	200	20	
		15	Broadcast and recording studios
	63	10	
		5	
Threshold of hearing	20	0	

Source: Highway Noise fundamentals, Federal Highway Administration, 1980
1 Micropascals (μPa) describe pressure levels, which is what sound level monitors measure.
2 A-weighted decibels (dBA) describe pressure logarithmically with respect to the reference pressure level of 20 μPa.

Sound levels were measured using a Larsen Davis 824 Type I sound level meter that meets the American National Standards Institute testing specifications. An acoustic calibrator was used to calibrate the sound level meter. The noise monitoring program was conducted on December 18 and December 30, 2008. Sound level data were collected at various locations adjacent to segments of the proposed alternative during weekday daytime period (10:00 A.M. to 5:00 P.M.) and weekday nighttime period (8:00 P.M. to 1:00 A.M.). The sound level data were collected for approximately 20-minute durations at each monitoring location.

Table 4.6-2 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor Leq(h)[1]	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq(h)[1]	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios and concert halls fall into this category. Places for meditation or study associated with cemeteries, monuments, museums. Certain historical sites, parks and recreational facilities are also included.

Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

Both Leq and Ldn sound levels were used to measure existing noise exposure. The noise metric for the land use Categories 1 and 3 in Table 4.6-2 is Leq. The noise metric for land use Category 2 (typically residences) is Ldn. The Ldn sound levels were calculated based upon daytime and nighttime Leq sound levels following the procedures provided in the FTA Transit Noise and Vibration Impact Assessment guidelines.

4.6.2.2 Existing Noise Levels

Existing noise levels were monitored at selected locations along various segments of the proposed alternatives. The noise monitoring sites were selected to provide background sound levels for similar land uses along the rail alternative corridors. Their selection was based upon land uses, accessibility, and reasonable area coverage. Figure 4.6-1 shows the alternatives, the rail and road segments in each alternative, town boundaries, and noise monitoring locations. The noise monitoring field notes are provided in Appendix 4.6-A.

All but one of the locations monitored was in an area of land use Category 2 (residences and buildings where people normally sleep). The exception was Morton Street in Stoughton on the Stoughton Line, which also has some land uses in Category 3 (institutional uses with primarily daytime and evening use).

Existing daytime sound levels (based on Leq), at the locations monitored, range from a low of about 49 dBA to a high of about 69 dBA. The 69-dBA level occurred at Dean Street in Taunton along the Stoughton Line. This sound level is typical of an area located near Route 44, a busy highway passing through an area with some commercial development. Eighteen of the 30 locations have noise levels equivalent to or below that of a quiet urban area in the daytime. Most of the remaining areas are between that level and the level for a suburban commercial area. Table 4.6-3 presents the land use and the results of the noise monitoring at each location.

Table 4.6-3 Existing Noise Levels at Monitoring Locations

ID	Location	Land Use Category[1]	Daytime Leq[2]	Nighttime Leq[2]	Ldn[3]
	New Bedford Main Line				
	Berkley				
1	Cotley Street	2	51.6	45.6	48.6
	Lakeville				
2	Gunner's Way	2	48.7	35.6	43.6
	New Bedford				
3	Welby Road	2	51.8	44.1	52.1
4	Earle & Davis Streets	2	55.6	47.6	55.6
	Fall River Secondary				
	Freetown				
5	Simpson & Green Lanes	2	55.3	41.2	44.2
	Fall River				
6	Rolling Green Apartments	2	55.5	43.8	46.8
7	Cory Street (west of RR)	2	57.2	52.1	55.1
	Stoughton Line				
	Stoughton				
10	Brock Street	2	59.4	42.4	50.4
11	Plain Street	2	62.6	-	60.6
12	Morton Street	2&3	63.5	50.9	58.9
	Easton				
13	Elm Street	2	61.8	48.8	56.8
14	Pond Street	2	55.8	38.8	46.8
15	Bridge Street	2	57.3	44.2	52.2
16	Short Street	2	56.7	49.5	57.5
17	Purchase Street	2	55.9	49.7	57.7
18	Prospect Street	2	60.9	54.8	62.8
	Raynham				
19	Elm Street (MP 15.40)	2	55.5	52.0	55.0
20	Carver Street	2	62.9	57.0	60.0
21	Britton Street	2	56.5	-	54.5
22	King Phillip Street	2	59.3	53.4	56.4
	Taunton				
23	Dean Street	2	68.8	61.7	64.7

1 See Table 4.6-2
2 The 1-hour average Leq dBA
3 The day-night averaged sound level dBA

4.6.3 Analysis of Impacts and Mitigation

4.6.3.1 Introduction

This section identifies the noise impacts that may result from implementing each of the proposed South Coast Rail alternatives (including railroad or highway alignments, train or bus stations, and maintenance/layover facilities).

The noise evaluation followed FTA guidance for the noise analysis procedures, identifying noise-sensitive receptor locations, noise impact criteria, measuring existing sound levels, calculating future sound levels, establishing impact thresholds, identifying noise impacted locations, and determining potential noise mitigation measures. The noise evaluation included the analysis of train noise (operations and train horn noise at grade-crossings) for the No-Build (Enhanced Bus), Stoughton Electric, Stoughton Diesel, Whittenton Electric, and Whittenton Diesel alternatives. The noise evaluation also analyzed train noise at the proposed train station and at the proposed overnight layover facilities. Specifically, the noise analysis establishes existing sound levels, calculated project-generated sound levels, developed the distances from the train tracks to moderate and severe noise impacts along the rail alternatives, identified impacted residences, and recommends noise mitigation measures.

For locations where noise impacts were identified, mitigation measures, such as noise barriers and sound-proofing, were identified to mitigate for significant adverse effects. In addition, potential noise mitigation measures for construction activities were identified.

The Secretary of the Executive Office of EEA issued a Certificate on the ENF on April 3, 2009.[2] Included in the certificate are a number of requirements defining the scope of the Draft EIR. The following outlines the requirements for the evaluation of noise impacts.

- The DEIR should include an analysis of noise impacts associated with the project alternatives, for locations along the rail and bus routes, and at station sites.
- The DEIR should evaluate measures to avoid and minimize noise impacts, including plantings and other noise barriers. The noise analysis in the DEIR should discuss consistency with applicable state and federal guidelines and regulations.
- The noise analysis should include an assessment of impacts to wildlife which is discussed in Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*.

The Secretary's Certificate on the DEIR[3] included the following requirements for the analysis of noise and vibration.

- "The FEIR should include a detailed evaluation of those locations that will experience moderate and severe noise impacts as a result of the project and commitments to specific mitigation measures."

[2] Massachusetts Executive Office of Energy and Environmental Affairs. Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. April 3, 2009.

[3] Massachusetts Executive Office of Energy and Environmental Affairs. Certificate of the Secretary of Energy and Environmental Affairs on the Draft Environmental Impact Report. July 29, 2011.

- "The evaluation should address noise impacts relating to all aspects of the project including train operations and horn noise, and noise associated with stations and layover facilities."
- "MassDOT should consult with MassDEP and the Interagency Coordinating Group for guidance on development of the noise mitigation plan."
- "The FEIR should include a detailed mitigation plan with commitments to an appropriate level of mitigation for project-related noise impacts."
- "The FEIR should document how the project will comply with MassDEP … Noise Policy."
- "The FEIR should compare the estimated vibration levels to existing conditions and describe the actual change that will be experienced. This additional information should be provided for residential impacts along the Stoughton route as well as for historic buildings."
- "The FEIR should include a mitigation plan with clear and specific commitments to address vibration impacts and an explanation of the reduction in VdB levels expected."

Subsequent to the DEIS/DEIR, the MassDOT updated the noise impact analysis for the Stoughton Electric Alternative to take into account design refinements, changes to the operations plan and to provide a more detailed noise impact assessment and mitigation plan as requested by Executive Office of EEA in the Secretary's Certificate on the DEIR. The noise impact and mitigation analyses for the Stoughton Diesel Alternative and the Whittenton (Diesel and Electric) Alternatives remain the same as presented in the DEIS/DEIR.

The following sections discuss the noise evaluation methodology, potential noise impacts by elements, construction noise, and potential noise impacts by alternative. Section 4.6.3.3 describes the background noise as well as the noise impact results for the South Coast Rail elements. Section 4.6.3.4 reviews the potential temporary construction impacts and related mitigation. Section 4.6.3.5 presents a summary of the impacts by each alternative. Section 4.3.3.6 identifies the type and location of the measures required to mitigate potential significant noise impacts.

4.6.3.2 Impact Assessment Methodology

The noise analysis identified potential noise impacts by comparing the existing sound levels to projected future sound levels. The existing sound levels were based upon a noise monitoring program. The FTA Transit Noise and Vibration Impact Assessment Guidelines[4] were used to evaluate existing noise conditions. These guidelines specify criteria and define procedures to project transit noise exposure. Detailed technical documentation of the noise impact assessment for the Stoughton Diesel Alternative and the Whittenton Alternatives is provided in Appendix 4.6-B (the documentation remains the same as was provided in the DEIS/DEIR).

The projected future sound levels were calculated using the FTA rail spreadsheet model. The results were compared to the FTA noise impact criteria discussed below to predict if noise impacts would occur. Once the future noise levels from the proposed project and the potential impacts were assessed, a determination of the need, feasibility, reasonableness, and effectiveness of mitigation measures was conducted. Appendix 4.6-C provides the updated impact assessment and mitigation analysis documentation for the Stoughton Electric Alternative.

[4] Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

The FTA guidelines require that noise-sensitive locations within impact distances to the rail corridor be categorized into the three types of noise-sensitive land uses (see Table 4.6-2)

Noise Impact Criteria

The FTA noise impact criteria are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. Although higher levels of transit noise are allowed in neighborhoods with high levels of existing noise, smaller increases in total noise exposure are allowed with increasing levels of existing noise.

The Day-Night Sound Level (Ldn) is used to characterize noise exposure for residential areas (Category 2). For other noise sensitive land uses, such as parks and school buildings (Categories 1 and 3), the maximum 1-hour "equivalent" sound level (Leq) during the facility's operating period is used (see Section 4.6.1.1).

The relationship between impact assessment and the three impact categories is as follows. There are two levels of impact (severe and moderate) included in the FTA criteria, as summarized below:

- **No Impact**: If the project noise exposure is less than the No Impact criteria, no commuter rail impacts are predicted.
- **Moderate Impact**: In this range of noise impact, the change in the cumulative noise level is noticeable to most people but may not be sufficient to cause strong, adverse reactions from the community. In this transitional area, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These factors include the existing noise level, the predicted level of increase over existing noise levels, the types and numbers of noise-sensitive land uses affected, the noise sensitivity of the properties, the effectiveness of the mitigation measures, community views, and the cost of mitigating noise to more acceptable levels. Moderate noise impact means that commuter rail service is predicted to increase noise exposures at sensitive land uses adjacent to the track.
- **Severe Impact**: Project-generated noise in the severe impact range can be expected to cause a significant percentage of people to be highly annoyed by the new noise and represents the most compelling need for mitigation. Noise mitigation will normally be specified for severe impact areas unless there are truly extenuating circumstances that prevent it. Severe impact means that commuter rail service is predicted to substantially increase noise exposures at sensitive land uses adjacent to the track.

The noise impact criteria are represented by the curves in Figure 4.6-2, also shown in *Transit Noise and Vibration Impact Assessment.*[5] In addition to graphic curves, the noise impact criteria can also be quantified through the use of mathematical equations included in Appendix B.3 of *Transit Noise and Vibration Impact Assessment*.[6] These equations reflect the curves shown in Figure 4.6-2, thus enabling the use of spreadsheets to facilitate the analysis of many sites. As described in *Transit Noise and Vibration Impact Assessment*,[7] the noise impact criteria are based on a comparison of the existing outdoor noise levels and the future outdoor noise levels from a proposed project. They incorporate both absolute criteria, which consider activity interference caused by the transit project alone, and relative

[5] Ibid.
[6] Ibid.
[7] Ibid.

criteria, which consider annoyance caused by the change in the noise environment caused by the transit project.

The horizontal axis of the graph in Figure 4.6-2 is the existing noise exposure and the vertical axis shows the additional noise exposure from the transit project that would cause either moderate or severe impact. The scale on the left vertical axis applies to the more noise-sensitive land uses in Categories 1 and 2 as described earlier. The scale on the right vertical axis applies to Category 3 land uses, which are less noise-sensitive than Categories 1 and 2. The future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by the transit project. Because sound levels represent energy, their values cannot be simply added and are combined logarithmically.

As described in *Transit Noise and Vibration Impact Assessment*,[8] the two curves in Figure 4.6-2 defining the FTA impact criteria allow increasing project noise levels as existing noise increases up to a point, beyond which impact is determined based on project noise alone. Below the lower curve in Figure 4.6-2, a proposed project is considered to have no noise impact since, on average, the introduction of the project will result in an insignificant increase in the number of people highly annoyed by the new noise. The curve defining the onset of noise impact stops increasing at 65 dB for Category 1 and 2 land use, a standard limit for an acceptable living environment defined by a number of federal agencies. Project noise above the upper curve is considered to cause Severe Impact since a significant percentage of people would be highly annoyed by the new noise. This curve flattens out at 75 dB for Category 1 and 2 land use, a level associated with an unacceptable living environment. As indicated by the right-hand scale on Figure 4.6-2, the project noise criteria are 5 dB higher for Category 3 land uses since these types of land use are considered to be slightly less sensitive to noise than the types of land use in Categories 1 and 2. Between the two curves the proposed project is judged to have Moderate Impact. Although the curves in Figure 4.6-2 are defined in terms of the project noise exposure and the existing noise exposure, it is the increase in the cumulative noise—when project noise is added to existing noise—that is the basis for the criteria.

To illustrate this point, Figure 4.6-3 shows the noise impact criteria for Category 1 and 2 land use in terms of the allowable increase in the cumulative noise exposure. The horizontal axis is the existing noise exposure and the vertical axis is the increase in cumulative noise level caused by the transit project. The measure of noise exposure is Ldn for residential areas and Leq for land uses that do not have nighttime noise sensitivity. Since Ldn and Leq are measures of total acoustic energy, *any* new noise source in a community would cause an increase, even if the new source level is less than the existing level. As shown in Figure 4.6-3, the criterion for Moderate Impact allows a noise exposure increase of 10 dBA if the existing noise exposure is 42 dBA or less but only a 1 dBA increase when the existing noise exposure is 70 dBA.

The procedure for assessing impact is to determine the existing noise exposure and the predicted project noise exposure at a given site, in terms of either Ldn or Leq(h) as appropriate, and to plot these levels on Figure 4.6-2. The location of the plotted point in the three impact ranges is an indication of the magnitude of the impact.

[8] Ibid.

Figure 4.6-2 FTA Noise Impact Criteria

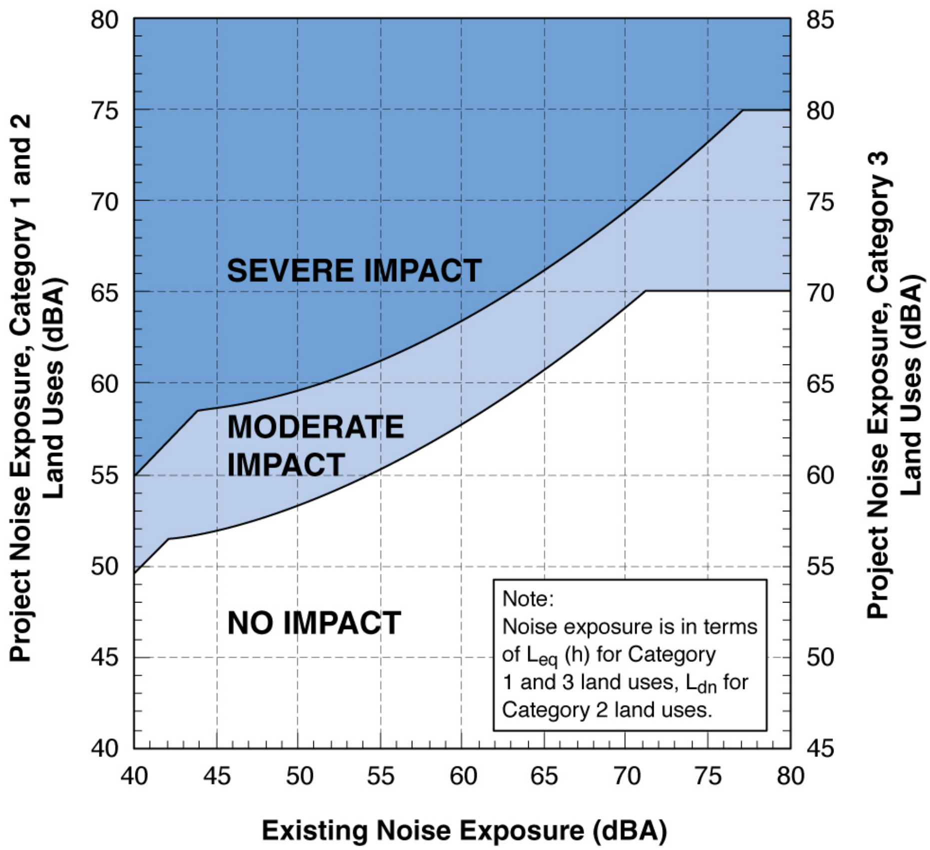
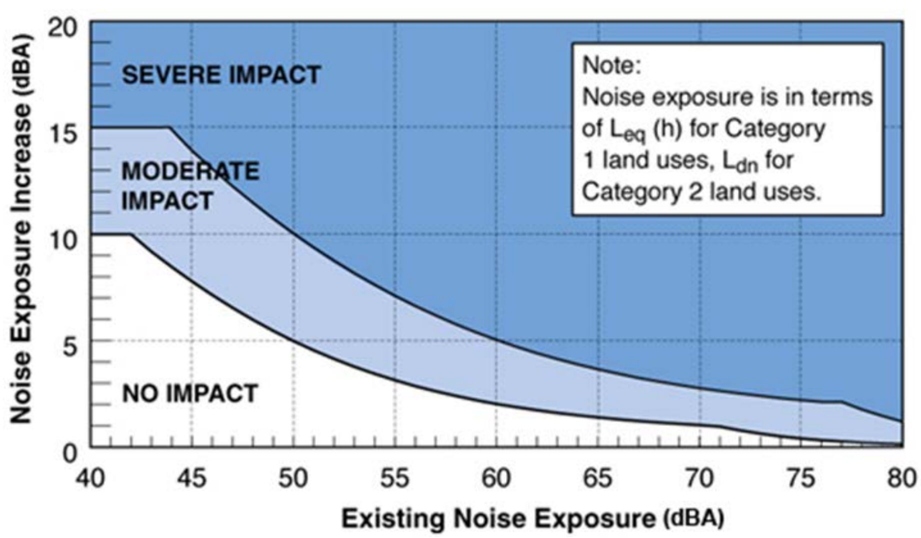


Figure 4.6-3 Increase in Cumulative Noise Levels Allowed by FTA Criteria



As described in *Transit Noise and Vibration Impact Assessment*,[9] when the existing level of ambient noise increases, the allowable level of transit noise also increases, but the total amount that community noise exposure is allowed to increase is reduced. A project noise exposure that is less than the existing noise exposure can thus still result in an impact, especially where existing noise exposure is already high.

In certain cases, according to *Transit Noise and Vibration Impact Assessment*,[10] only the cumulative form of the noise criteria as shown in Figure 4.6-3 should be used. These cases involve projects where changes are proposed to an existing transit system, as opposed to a new project in an area previously without transit. Such changes might include operations of a new type of vehicle, modifications of track alignments within existing transit corridors (such as moving the existing commuter rail lines for the South Coast Rail project, or changes in facilities that dominate existing noise levels. In these cases, the existing noise sources change as a result of the project, and so it is not possible to define project noise separately from existing noise.

Another condition cited in *Transit Noise and Vibration Impact Assessment*[11] includes a commuter rail corridor where the existing noise along the alignment is dominated by diesel locomotive-hauled trains and where the project involves replacement of some of the diesel-powered locomotives with electric trains operating at increased frequency of service and higher speeds on the same tracks. In this case, the existing noise can be determined and a new future noise can be calculated, but it is not possible to describe what constitutes the “project noise.” For example, if the existing noise dominated by trains was measured to be an Ldn of 63 dBA at a particular location, and the new combination of diesel and electric trains is projected to be an Ldn of 65 dBA, the change in the noise exposure caused by the project would be 2 dB. Referring to Figure 4.6-3, a 2 dB increase with an existing noise exposure of 63 dBA would be rated as a Moderate Impact. Normally the project noise is added to the existing noise to come up with a new cumulative noise, but in this case, the existing noise was dominated by a source that changed because of the project, so it would be incorrect to add the project noise to the existing noise.

A similar example would be a rail corridor where a track is added and grade crossings are closed, potentially resulting in a change in train location and horn operation. In this case the “project noise” results from moving some trains closer to some receivers, away from others, and elimination of horns, and the *change* in noise level is more readily determined than the noise from the actual project elements.

Noise generated by train operations depends on the type and number of locomotives and rail cars, the type of rail and track structure, the speed of the train, and the condition of rail and train wheels. The noise assessment is based on the following assumptions, which have a direct effect on the noise exposure resulting from the rail operations:

- Each train contains either one diesel or electric locomotive and eight coaches.
- The train speeds were based on the proposed track charts for each alternative. Diesel and electric locomotives were assumed to have a maximum speed of 70 and 100 mph, respectively.

[9] Ibid.
[10] Ibid.
[11] Ibid.

- The track is continuously welded (without joints that create impact noise) and is secured to concrete ties mounted on rock ballast.
- The train wheels are true (without flat spots) and the rail is smooth (without corrugations).
- Train warning horns will be used on a routine basis at all grade-crossings.

Future noise levels from the commuter trains are projected based on the existing measured noise levels at sensitive locations and changes to the alignment. Since future noise levels are based on existing noise levels, where appropriate, the projections include all operations from MBTA commuter trains, Amtrak trains, and freight rail activity. With this modeling approach, the projections include the contributions from several factors, such as train speed, presence of special trackwork or other site-specific conditions.

The existing and future commuter train noise levels depend on different sound propagation conditions caused by changes to the commuter rail alignment and modification to any special trackwork. The relative contributions of noise from trains on both tracks and from locomotives versus rail cars are included in this modeling. Future noise levels from the proposed South Coast Rail trains are based on reference noise levels (discussed below), site-specific conditions such as the terrain, intervening objects such as building rows, and operational plans including the number of cars in a train, speed, and headways.

Commuter Rail Operations

Noise-sensitive locations along the proposed commuter rail corridors were identified from MassGIS, aerial photography, and field survey. The majority of the noise-sensitive buildings within 1,000 feet of the rail corridor are residences (Land Use Category 2). Numerous schools, places of worship, and libraries (Land Use Category 3) were identified near the rail line. No amphitheaters, concert pavilions, or National Historic Landmarks with significant outdoor use (Land Use Category 1) were identified within 1,000 feet of the rail corridor.

Existing noise exposure at sensitive receptors along the proposed commuter rail corridor varies from 45 to 70 Ldn for the No-Build Alternative. The corridor passes through urban, suburban, and rural areas that have existing noise exposures that range from quiet to moderately noisy. These existing noise exposures are dominated by noise from nearby roadways. Existing noise exposures above 60 Ldn generally result from traffic volume adjacent to the rail corridor and/or from current train activity on the rail corridor. Both occur at locations that are within 150 feet of the existing track.

Impact distances from the rail line were calculated based upon the existing sound levels, train generated sound levels, and distances to noise impacts based upon FTA's noise impact criteria.[12] The FTA's noise impact criteria (see Figures 4.6-2 and 4.6-3) establish the noise impact sound levels (thresholds) based upon the existing sound levels for each receptor location. The noise analysis calculates the distances to the noise impact sound levels based upon the train activity at the receptor locations. The MassGIS mapping identifies the number of receptor locations within the distances of noise impacts. These calculations were conducted for both moderate and severe noise impacts. Table 4.6-4 summarizes the calculated noise impact distances for various existing sound levels.

[12] Federal Transit Administration, Transit Noise and Vibration Impact Assessment, figures 3-1 and 3-2: "Noise Levels Defining Impact for Transit Projects", FTA-VA-90-1003-06, May 2006.

Table 4.6-4 Noise Impact Distances (Feet), by Existing Noise Level (dBA)

Existing Sound Level (Ldn)	Distance to Impact Level (Feet) Severe Closer than (ft.)	Moderate Between (ft.)	No Impact farther than (ft.)
50-54	225	225-450	450
55-59	120	120-400	400
60	115	115-225	225
61	100	100-200	200
62	100	100-200	200
63	75	75-175	175
64	75	75-175	175
65	65	65-150	150
66	55	55-135	135
67	55	55-135	135
68	50	50-115	115
69	45	45-100	100
70	45	45-100	100

Horn Issues and Considerations

In 1996, the U.S. Congress passed the Swift Act, which requires that railroads sound whistles at all grade crossings. The Act provided an exception for grade crossings that are equipped with supplemental safety measures, such as extended barriers, medians, one-way streets, or four quadrant gates. For analysis purposes, it was assumed that the horns will be sounded one-quarter mile prior to all public grade crossings for each of the rail alternatives. This horn is required as a safety measure by the Federal Railroad Administration, Department of Transportation.[13]

4.6.3.3 Impacts of Alternatives by Element

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would not include any change in existing train activity but would include an enhancement of the current bus service along existing roads and highways. It was assumed that the limited increase in bus service would occur along major roadways (I-93 and Route 24) and commuter parking areas. The low volumes of increased buses on these roadways would have a minimal effect on the sound levels within the study area.

The FTA Guidelines require that noise impacts are based on the comparison between existing sound levels and future build sound levels. The assumption that the 2030 No-Build sound levels are equal to the existing sound levels provides a uniform and conservative basis for comparison to the Build Alternatives. Furthermore, sound levels in the area that measurements were conducted are not anticipated to change significantly (1 to 3 dBA) over the next 20 years. Therefore it is conservative to assume that the 2030 No-Build sound levels are equal to the existing sound levels and this assumption does not affect the determination of potential noise impacts. Therefore the existing (2009) sound levels

[13] Federal Railroad Administration, Department of Transportation13, Title 49, Chapter II: PART 222—Use of Locomotive Horns at Public Highway Rail Grade Crossings.

were assumed for the future (2030) No-Build Alternative. Table 4.6-5 presents a summary of the sound levels for the No-Build (Enhanced Bus) Alternative.

Southern Triangle Study Area (Common to All Rail Alternatives)

Portions of the rail elements within the southern part of the South Coast Rail study area are common to all the rail alternatives. These rail elements form a triangular shape between the Fall River Secondary and the New Bedford Main Line, and are therefore referred to as the Southern Triangle. The Fall River Secondary extends from Myricks Junction to Fall River. The New Bedford Main Line extends from Weir Junction to New Bedford. The following sections describe the environmental consequences related to the noise impacts that may result from the South Coast Rail project. The northern elements of the South Coast Rail study area are encompassed by the other rail Build Alternatives described in subsequent sections.

Fall River Secondary Rail Segment

The existing Fall River Secondary freight track would be upgraded to Federal Rail Administration (FRA) Class 5[14] for the South Coast Rail project. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the Fall River Secondary is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line and two new traction power facilities would need to be constructed for the electric alternatives. Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one new station would be constructed in Freetown (Freetown). One new layover facility would be constructed in Fall River, at the Weaver's Cove East site. Potential noise impacts to land uses resulting from constructing the new stations and layover facilities along the Fall River Secondary are considered in the Stations and Layover Facilities sections, respectively.

As shown in Table 4.6-6, electric train operations for the Fall River Secondary would result in 466 moderate and 135 severe impacts to residential receptors. The majority of these would occur in Fall River, in the Cory and Durfee Street neighborhoods. The diesel operations would have greater impacts than electric commuter rail along the Fall River Secondary, with 570 moderate and 181 severe impacts (Table 4.6-7). Train horns along this corridor would add 98 moderate and 164 severe impacts (Table 4.6-8). Mapping of the noise impacts associated with the Fall River Secondary segment is provided as follows:

- Diesel alternatives train pass-by noise impact areas and horn noise impacts for both diesel and electric alternatives: Figures 4.6-4a through 4.6-4c.
- Updated train pass-by noise impacts for electric alternatives: Figures 4.6-4a through 4.6-4c.

[14] 49 CFR 213.9 Classes of Track: Operating Speed Limits

Table 4.6-5 Noise Levels–No-Build Alternative

Segment/ Municipality/ Receptor Location	Land Use Category	No-Build Sound Level	Segment/ Municipality/ Receptor Location	Land Use Category	No-Build Sound Level	Segment/ Municipality/ Receptor Location	Land Use Category	No-Build Sound Level
Fall River Secondary			**New Bedford Main Line**			**Northeast Corridor**		
Berkley			***Taunton***			***Dedham***		
Grove Street	2	55	Ingell Street	2	57	Hooper Road (Existing Barrier)	2	69
Mill street	2	45	Hart Street	2	63			
Adams Lane	2	45	Plain Street	2	55			
						Westwood		
			Berkley			University Ave (Funeral Institute of the North East)	3	69
Freetown			Cotley Street	2	49			
Richmond Road	2	60	Padelford Street	2	55			
Colonial Drive	2	45	Myricks Street (Route 79)	2	60	***Canton***		
Richmond Road	2	60				I-95 - Industrial	2	70
Forge Road	2	55	***Lakeville***			Chapman Street	2	70
Elm & Walnut Streets	2	55	Malbone Street	2	55	Norfolk Street	2	68
Simpson & Green Lanes	2	44	Howland Road	2	55	High Street	2	63
High Street	2	55	Gunner's Way	2	44			
Copicut Road	2	55				***Sharon***		
			Freetown			Rhodes Avenue	2 & 3	64
			Chace Road	2	60	Upland Road (Route 27)	2 & 3	63
Fall River			Chipaway Road	2	60	Flintlock Road - Deborah Sampson Park	2	62
Rolling Green Apartments	2	47				Chase Drive	2 & 3	63
North Main St (FRCC to Route 79)	2 & 3	60	***New Bedford***			Burnt Bridge Road	2	67
Cory Street (west of RR)	2 & 3	55	Welby Road	2	52			
Durfee Street (Route 6A to I-195)	2 & 3	55	Tarkiln Place	3	52	***Foxborough***		
			Worcester Street	2	55	East Street	2 & 3	65
			Earle & Davis Streets	2	56	Summer Street	2	65
			Hayden/McFadden School	2 & 3	65			
			Purchase Street	2 & 3	65			

Table 4.6-6 Noise Levels–Southern Triangle, Electric Alternatives, Fall River Secondary

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Berkley					
Myricks Street (Route 79)	2	60	66	10	1
Mill Street	2	45	60	3	3
Adams Lane	2	45	66	8	1
Subtotal				**21**	**5**
Freetown					
Richmond Road (Bryant to Beechwood)	2	60	65	4	1
Colonial Drive	2	45	58	7	0
Richmond Road (Colonial to Forge)	2	60	67	1	1
Forge Road	2	55	64	9	5
Elm & Walnut Street	2	55	65	11	3
Simpson & Green Lanes	2	44	69	15	6
High Street	2	55	63	10	3
Copicut Road	2	55	58	3	0
Subtotal				**60**	**19**
Fall River					
Rolling Green Apts.	2	47	65	53	13
North Main Street (FRCC to Rt. 79)	2	60	67	41	5
Cory Street (west of RR)	2	55	70	151	55
Durfee Street (Route 6A – I-195)	2	55	69	140	38
Subtotal				**385**	**111**
Total				**466**	**135**

Table 4.6-7 Noise Levels–Southern Triangle, Diesel Alternatives, Fall River Secondary

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Berkley					
Grove Street	2	55.0	64	2	0
Mill street	2	45.0	65	4	5
Adams Lane	2	45.0	68	7	3
			Totals	**13**	**8**
Freetown					
Richmond Road (Bryant to Beechwood)	2	60.0	68	4	1
Colonial Drive	2	45.0	62	12	1
Richmond Road (Colonial to Forge)	2	60.0	68	2	2
Forge Road	2	55.0	68	17	6
Elm & Walnut Streets	2	55.0	68	9	3
Simpson & Green Lanes	2	44.2	68	15	5
High Street	2	55.0	65	23	3
Copicut Road	2	55.0	58	2	0
			Totals	**84**	**21**
Fall River					
Rolling Green Apartments	2	46.8	68	60	13
North Main Street (FRCC to Route 79)	2 & 3	60.0	68	42	17
Cory Street (west of RR)	2 & 3	55.1	68	180	66
Durfee Street (Route 6A to I-195)	2 & 3	55.1	68	191	56
			Totals	**473**	**152**
Totals				**570**	**181**

Table4.6-8 Train Horn Noise Impact Summary–Southern Triangle, Fall River Secondary

Municipality	At Grade Crossing	Number of Impacts: Moderate	Number of Impacts: Severe
Fall River	Golf Service Road - South	7	5
Freetown	Copicut Road	1	1
Freetown	Elm Street	58	99
Freetown	Forge Road - South	7	22
Freetown	High Street	6	12
Freetown	Richmond Road - North	9	5
Freetown	Richmond Road - South	10	20
	Total	**98**	**164**

New Bedford Main Line Rail Segment

The existing New Bedford Main Line freight track would be upgraded to FRA Class 5 for the South Coast Rail project. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the New Bedford Main Line is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and four or five traction power facilities (depending upon the alternative selected) would need to be constructed for the electric alternatives. Two new train stations would be constructed in New Bedford (Whale's Tooth and King's Highway), and one new train station would be constructed in Taunton (Taunton Depot). One new layover facility would be constructed at the Wamsutta site. Potential direct impacts to land uses resulting from the constructing the new stations and layover facility along the New Bedford Main Line are considered in the Stations and Layover Facilities sections, respectively.

As shown in Table 4.6-9, electric train operations for the New Bedford Main Line segment would result in 236 moderate and 47 severe impacts to residential receptors. The majority of these would occur in Taunton and New Bedford, in the Plain Street, Welby Road, and Worcester Street neighborhoods. The diesel operations would have lower impacts, with 185 moderate and 35 severe impacts (Table 4.6-10). Train horns along this segment would add 93 moderate and 76 severe impacts (Table 4.6-11).

Mapping of the noise impacts associated with the New Bedford Mainline is provided as follows:

- Diesel alternatives train pass-by noise impact areas and horn noise impacts for both diesel and electric alternatives: Figures 4.6-5a through 4.6-5e.
- Updated train pass-by noise impacts for electric alternatives: Figures 4.6-5a through 4.6-5e.

Table 4.6-9 Noise Levels–Southern Triangle, Electric Alternative, New Bedford Main Line

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Taunton					
Ingell Street	2	57	64	6	2
Hart Street	2	63	68	16	4
Plain Street	2	55	62	10	6
Subtotal				**32**	**12**
Berkley					
Cotley Street	2	49	64	16	6
Padelford Street	2	55	66	4	3
Subtotal				**20**	**9**
Lakeville					
Malbone Street	2	55	63	1	1
Howland Road	2	44	59	8	1
Gunner's Way	2	55	65	18	6
Subtotal				**27**	**8**
Freetown					
Chace Road	2	60	61	2	0
Chipaway Road	2	60	67	12	6
Subtotal				**14**	**6**
New Bedford					
Welby Road	2	52	59	31	0
Worcester Street	2	55	65	73	10
Earle & Davis Streets	2	56	62	30	2
Hayden/McFadden	2	65	64	9	0
Subtotal				**143**	**12**
Total				**236**	**47**

Table 4.6-10 Noise Levels–Southern Triangle, Diesel Alternative, New Bedford Main Line

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Taunton					
Ingell Street	2	56.5	67	6	2
Hart Street	2	62.5	69	16	4
Plain Street	2	55.0	67	31	15
			Totals	**53**	**21**
Berkley					
Cotley Street	2	48.6	64	11	3
Padelford Street	2	55.0	67	3	2
Myricks Street (Route 79)	2	60.0	67	4	1
			Totals	**18**	**6**
Lakeville					
Malbone Street	2	55.0	64	0	1
Howland Road	2	55.0	66	12	2
Gunner's Way	2	43.6	59	9	0
			Totals	**21**	**3**
Freetown					
Chace Road	2	60.0	61	2	0
Chipaway Road	2	60.0	68	0	2
			Totals	**2**	**2**
New Bedford					
Welby Road	2	52.1	58	22	0
Tarkiln Place	3	52.1	53	0	0
Worcester Street	2	55.0	66	52	2
Earle & Davis Streets	2	55.6	62	8	1
Hayden/McFadden School	2 & 3	65.0	68	9	0
Purchase Street	2 & 3	65.0	N/A	0	0
			Totals	91	3
Totals				**185**	**35**

Note: N/A – Not applicable since no residential uses are located within impact zones.

Table 4.6-11 Train Horn Noise Impact Summary–Southern Triangle, New Bedford Main Line

Town	At Grade Crossing	Number of Impacts Moderate	Severe
Berkley	Cotley Street	12	11
Berkley	Myricks Street	18	18
Berkley	Padelford Street	7	6
Freetown	Braley Road	5	18
Freetown	Chace Road	9	4
Freetown	East Chipaway Road	7	7
Lakeville	Malbone Street	11	6
New Bedford	Nash Road	8	0
New Bedford	Tarkiln Hill Road	16	6
	Total	**93**	**76**

Stoughton Electric Alternative

The Stoughton Electric Alternative would comprise a portion of the Northeast Corridor, the entire Stoughton line, and the Southern Triangle elements. This alternative would use the Northeast Corridor from South Station to Canton Junction. From Canton Junction, the existing Stoughton Line would be used to the existing Stoughton Station. From there, commuter rail service would be extended, reconstructing a railroad on an out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton. This alignment joins the New Bedford Main Line at Weir Junction, the northern end of the Southern Triangle. This evaluation focuses on the existing and extended Stoughton Line segment.

The existing Stoughton Line commuter rail track from Canton Junction to Stoughton Station would be upgraded to FRA Class 5 for the Stoughton Electric Alternative. New track would be placed on the out-of-service railroad bed from Stoughton Station south to Weir Junction. The existing public at-grade road/railroad crossings would be reconfigured and/or improved to meet current safety standards. The improved track and at-grade road/railroad crossings would also reduce sound levels generated by train activities.

As shown in Table 4.6-12 and Figures 4.6-6h-l, electric train operations for the Stoughton Line segment would result in 404 moderate and 159 severe impacts to residential receptors. The majority of these would occur in Easton and Raynham, in the Elm Street (Easton), Bridge Street, and Elm Street (Raynham) neighborhoods. Train horns along this segment would add 437 moderate and 457 severe impacts (see below).

Table 4.6-12 Noise Levels–Stoughton Line, Stoughton Electric Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Stoughton					
Brock Street	2	50	69	44	1
Plain Street	2	61	71	24	12
Morton Street	2	59	70	16	8
Subtotal				**84**	**21**
Easton					
Elm Street	2	57	67	57	17
Oliver Street	2	52	64	5	4
Pond Street	2	47	62	13	3
Main Street	2	62	70	10	11
Bridge Street	2	52	67	94	52
Short Street	2	58	67	16	12
Depot Street/123	2	65	67	1	1
Purchase Street	2	58	64	16	4
Prospect Street	2	63	63	6	0
Subtotal				**218**	**104**
Raynham					
Elm Street (MP 15.40)	2	55	68	16	8
Carver Street	2	60	65	5	1
Britton Street	2	55	68	20	6
King Phillip Street	2	56	69	23	8
Subtotal				**64**	**23**
Taunton					
Longmeadow Street	2	59	70	20	5
Dean Street	2	65	69	18	6
Subtotal				38	11
Total				**404**	**159**

Stoughton Diesel Alternative

The Stoughton Diesel Alternative alignment comprises same components as the Stoughton Electric Alternative with the exception of the locomotive power source. Due to lower operating speeds of diesel trains (and thus lower noise levels) the diesel operations would have slightly lower noise impacts than the electric operations, with 330 moderate and 128 severe impacts (See Table 4.6-13 and Figures 4.7h-l). Table 4.6-14 summarizes the horn noise impacts along the Stoughton Line for the diesel and electric alternatives.

Table 4.6-13 Noise Levels–Stoughton Line, Stoughton Diesel Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Stoughton					
Brock Street	2 & 3	50.4	66	13	1
Plain Street	2	60.6	69	31	15
Morton Street	2	58.9	66	12	5
			Totals	**56**	**21**
Easton					
Elm Street	2 & 3	56.8	67	52	16
Oliver Street	2	51.8	64	4	3
Pond Street	2 & 3	46.8	61	12	1
Main street	2 & 3	61.5	69	6	7
Bridge Street	2	52.2	69	81	34
Short Street	2 & 3	57.7	69	1	7
Depot Street/Route 123	2 & 3	65.2	69	2	0
Purchase Street	2	57.7	64	9	3
Prospect Street	2 & 3	62.9	63	3	0
			Totals	**170**	**71**
Raynham					
Elm Street	2	55.0	69	52	16
Carver Street	2	60.0	65	1	1
Route 138	2 & 3	63.4	N/A	0	0
Britton Street	2	54.5	69	10	6
King Phillip Street	2	56.4	69	18	8
			Totals	**81**	**31**
Taunton					
Longmeadow Street	2	59.0	69	15	3
Dean Street	2 & 3	64.7	69	8	2
			Totals	**23**	**5**
Totals				**330**	**128**

Note: N/A – Not applicable since no residential uses are located within impact zones.

Table 4.6-14 Train Horn Noise Impact Summary–Stoughton Alternatives

		Number of Impacts	
Municipality	**At Grade Crossing**	**Moderate**	**Severe**
Easton	Country Club	4	4
Easton	Depot Street - Route 123	24	17
Easton	Easton DPW	54	55
Easton	Foundry Street - Route 106	3	3
Easton	Gary Lane	12	10
Easton	Oliver Street	48	64
Easton	Prospect Street	12	15
Easton	Purchase Street	28	27
Easton	Short Street	15	21
Raynham	Britton Street	19	25
Raynham	Carver Street	10	9
Raynham	East Brittania Street	0	1
Raynham	King Phillip Street	14	29
Stoughton	Brock Street	57	47
Stoughton	Plain Street	32	48
Stoughton	Wyman Street	69	54
Taunton	Dean Street - Route 44	21	15
Taunton	Longmeadow Road	15	13
	Total	**437**	**457**

Whittenton Electric Alternative

The Whittenton Electric Alternative is a modification of the Stoughton Electric Alternative alignment described previously. At Raynham Junction, the route would divert to the southwest, following the out-of-service Whittenton Branch. This alignment would connect with the Attleboro Secondary at Whittenton Junction in Taunton, and then continue on toward the southeast to connect with the New Bedford Main Line at Weir Junction. The southernmost portion of the Stoughton Line (from Raynham Junction to Weir Junction) would not be used under this alternative. This evaluation focuses on the Whittenton Branch and Stoughton segment components; other components of this alternative (Southern Triangle Fall River Secondary and Southern Triangle New Bedford Main Line) are described in the section on the Southern Triangle study area.

As shown in Table 4.6-15 and Table 4.6-16 and Figures 4.6-7a-b, electric train operations would result in 171 moderate and 35 severe impacts to residential receptors for the Whittenton segment and 359 moderate and 164 severe impacts to residential receptors for the Stoughton segment. Train horns along the Whittenton segment would add 460 moderate and 708 severe impacts with an additional 368 moderate and 374 severe impacts along the Stoughton segment (see Tables 4.6-19 and 4.6-20).

Table 4.6-15 Noise Levels–Whittenton Branch, Whittenton Electric Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Raynham					
Britton Street / King Philip Street	2	55.0	67	14	2
			Totals	**14**	**2**
Taunton					
Redwood Drive	2	55.0	67	19	3
Third Avenue	2 & 3	65.0	63	0	0
Warren Street	2 & 3	55.0	62	14	0
West Britannia Street	2	55.0	58	2	0
Edwards Avenue	2	45.0	64	17	6
Danforth Street	2	55.0	63	22	4
Horton Street	2	44.4	68	27	5
Tremont Street (Route 140)	2 & 3	65.0	68	5	0
Winthrop Street	2 & 3	65.0	65	10	3
Webster Street	2 & 3	56.4	65	31	11
Weir Street & Somerset Avenue (Route 138)	2 & 3	65.0	65	10	1
			Totals	**157**	**33**
Totals				**171**	**35**

Note: This table represents the Whittenton Branch and the Attleboro Secondary from Whittenton Junction to Weir Junction.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. As shown in Tables 4.6-17 and 4.6-18, diesel operations would result in 194 moderate and 42 severe impacts along the Whittenton segment and 279 moderate and 109 severe impacts along the Stoughton segment. As mentioned in the previous section, train horns along the Whittenton segment would add 460 moderate and 708 severe impacts with an additional 368 moderate and 374 severe impacts along the Stoughton segment (See Tables 4.6-19 and 4.6-20).

Table 4.6-16 Noise Levels–Stoughton Line, Whittenton Electric Alternative

Municipality/ Receptor Location	Land Use Category	Existing Sound Level	Moderate Impact		Severe Impact	
			Impact Threshold	Number of Impacts	Impact Threshold	Number of Impacts
Stoughton						
Brock Street	2 & 3	50.4	53.5	4	59.7	1
Plain Street	2	60.6	58.1	34	63.7	17
Morton Street	2	58.9	57.2	16	62.9	8
Subtotal				**54**		**26**
Easton						
Elm Street	2 & 3	56.8	56.1	73	56.8	25
Oliver Street	2	51.8	54.0	5	51.8	4
Pond Street	2 & 3	46.8	52.4	10	46.8	3
Main street	2 & 3	61.5	58.6	10	61.5	11
Bridge Street	2	52.2	54.1	92	52.2	52
Short Street	2 & 3	57.7	56.5	15	57.7	12
Depot Street/Route 123	2 & 3	65.2	61.0	1	65.2	1
Purchase Street	2	57.7	56.6	16	57.7	4
Prospect Street	2 & 3	62.9	59.4	6	62.9	0
Subtotal				**228**		**112**
Raynham						
Elm Street	2	55.0	55.3	73	61.2	25
Carver Street	2	60.0	57.8	4	63.4	1
Route 138	2 & 3	63.4	59.8	0	65.2	0
Subtotal				**77**		**26**
Total				**359**		**164**

Table 4.6-17 Noise Levels–Whittenton Branch, Whittenton Diesel Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Raynham					
Britton Street / King Philip Street	2	55.0	68	15	2
			Totals	**15**	**2**
Taunton					
Redwood Drive	2	55.0	68	21	3
Third Avenue	2 & 3	65.0	64	0	0
Warren Street	2 & 3	55.0	63	18	0
West Britannia Street	2	55.0	60	3	0
Edwards Avenue	2	45.0	64	20	6
Danforth Street	2	55.0	64	26	4
Horton Street	2	44.4	69	28	7
Tremont Street (Route 140)	2 & 3	65.0	67	5	0
Winthrop Street	2 & 3	65.0	66	16	3
Webster Street	2 & 3	56.4	66	30	16
Weir Street & Somerset Avenue (Route 138)	2 & 3	65.0	66	12	1
			Totals	**179**	**40**
Totals				**194**	**42**

Note: This table represents the Whittenton Branch and the Attleboro Secondary from Whittenton Junction to Weir Junction

Stations

Noise at the proposed South Coast Rail train stations would be dominated by trains approaching and departing the stations. The other minor noise sources include automobiles, which are associated with the patron arrivals and departures, bus idling in the bus loading zones, and P.A. systems in the platform area (if any are constructed) are not expected to contribute to the overall sound levels and impacts. Trains would idle at the train stations for a brief period to discharge and pick-up passengers. As a result, the dominant noise source around the train stations would be from approaching and departing trains. The sound level results and impacts of receptor locations near train stations are summarized in Tables 4.6-6 through 4.6-20.

For the Stoughton Electric Alternative, the impact analysis results take into account the relocation of the Stoughton Station as described in Chapter 3. Impact analysis results for the Stoughton Diesel Alternative have not been updated since the DEIS/DEIR and thus reflect the original Stoughton Station location. Similarly, the noise impact analyses for the Whittenton Diesel and Electric Alternatives do not take into account the relocation of the Stoughton Station or the change in the Downtown Taunton Station location to Dana Street. However, given that noise in the vicinity of stations is dominated by train

operations, not the stations themselves, the station location changes would not substantially change noise impacts from those presented in the DEIS/DEIR for the purposes of comparing alternatives.

Table 4.6-18 Noise Levels – Stoughton Line, Whittenton Diesel Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Stoughton					
Brock Street	2 & 3	50.4	66	13	1
Plain Street	2	60.6	69	31	15
Morton Street	2	58.9	66	12	5
			Totals	**56**	**21**
Easton					
Elm Street	2 & 3	56.8	67	52	16
Oliver Street	2	51.8	64	4	3
Pond Street	2 & 3	46.8	61	12	1
Main street	2 & 3	61.5	69	6	7
Bridge Street	2	52.2	69	81	34
Short Street	2 & 3	57.7	69	1	7
Depot Street/Route 123	2 & 3	65.2	69	2	0
Purchase Street	2	57.7	64	9	3
Prospect Street	2 & 3	62.9	63	3	0
			Totals	**170**	**71**
Raynham					
Elm Street	2	55.0	69	52	16
Carver Street	2	60.0	65	1	1
Route 138	2 & 3	63.4	N/A	0	0
			Totals	**53**	**17**
Totals				**279**	**109**

Table 4.6-19 Train Horn Noise Impact Summary–Whittenton Branch of Whittenton Alternative

Municipality	At Grade Crossing	Number of Impacts Moderate	Number of Impacts Severe
Taunton	Cohannet Street	38	67
Taunton	Danforth Street	34	31
Taunton	Harrison Avenue	60	112
Taunton	Oak Street	34	22
Taunton	Porter Street	26	46
Taunton	Somerset Avenue	66	93
Taunton	Tremont Street	43	29
Taunton	Warren Street	10	39
Taunton	Weir Street	63	65
Taunton	West Brittania Street	10	24
Taunton	Whittenton Street	27	102
Taunton	Winthrop Street	49	78
	Total	**460**	**708**

Table 4.6-20 Train Horn Noise Impact Summary–Stoughton Line of Whittenton Alternative

Municipality	At Grade Crossing	Number of Impacts Moderate	Number of Impacts Severe
Easton	Country Club	4	4
Easton	Depot Street - Route 123	24	17
Easton	Easton DPW	54	55
Easton	Foundry Street - Route 106	3	3
Easton	Gary Lane	12	10
Easton	Oliver Street	48	64
Easton	Prospect Street	12	15
Easton	Purchase Street	28	27
Easton	Short Street	15	21
Raynham	Carver Street	10	9
Stoughton	Brock Street	57	47
Stoughton	Plain Street	32	48
Stoughton	Wyman Street	69	54
	Total	**368**	**374**

Layover Facilities

Noise at the proposed South Coast Rail layover facilities would be dominated by trains idling diesel locomotives (under the diesel alternatives only). Diesel trains that remain at the layover facilities for 1 hour or longer would be shut down and attached to electrical power, as needed. The other minor noise sources on site are not expected to contribute to the overall sound levels and impacts. Distances to moderate and severe impact at the layover facilities were calculated based on the Source Reference Level of 109 dBA at 50 feet from the center of the site for layover tracks, based on Table 5-5 of *Transit*

Noise and Vibration Impact Assessment.[15] This analysis revealed one moderate impact at the proposed Weaver's Cove facility. The existing sound levels, the project sound levels, and the number of impacts are shown in Table 4.6-21 and Figures 4.6-4b and 4.6-5e.

Table 4.6-21 Layover Facilities Sound Levels and Impacts

Layovers Location	Noise Exposure at 50 feet (Ldn)	Existing Noise Exposure (Ldn)	Moderate Impact Ldn	Moderate Impact Number of Impacts	Severe Impact Ldn	Severe Impact Number of Impacts
Fall River - Weaver's Cove East	79.8	55	55.3	1	61.2	0
New Bedford - Wamsutta Site	79.8	60	57.8	0	63.4	0

Assumptions: A Source Reference Level of 109 dBA at 50 feet from the center of the site for layover tracks was used based on Table 5-5 of Transit Noise and Vibration Impact Assessment.
All facilities are assumed to have one train idling per hour (day and night).

4.6.3.4 Temporary Construction-Period Impacts and Mitigation

Temporary noise impacts could result from construction activities associated with utility relocation, grading, excavation, track work and installation of systems components. Such impacts may occur in residential areas and at other noise-sensitive land use located within several hundred feet of the alignment. The potential for noise impact would be greatest at locations near pile driving operations for bridges and other structures, and at locations close to any nighttime construction activities.

Track Improvements

The South Coast Rail project may create noise impacts as a result of track and bridge reconstruction activities. Construction activities would increase sound levels in adjacent areas; however, these sound level increases would be temporary and would move with construction activities. The particular types of construction equipment or activities are not defined at this stage of the design. Therefore, construction impacts cannot be quantitatively assessed at this time.

Since rail replacement activities, which include grading, ballast, and rail construction, would continuously move along the corridor, noise from these activities would only occur for several weeks at any one location. Bridge and grade crossing reconstruction activities would occur for a slightly longer duration, since these activities require more time. None of the noise impacts associated with track improvements would be permanent.

Station Construction

Station construction activities may increase noise exposures in adjacent areas during some phases of the construction. However, these increases would be temporary. Since particular construction equipment and activities are not defined at this stage of design, construction impacts cannot be quantitatively assessed at this time.

MassDOT has indicated that every reasonable attempt would be made to minimize construction noise impacts. Construction noise control is accomplished by the use of quiet equipment and procedures. Noise guidelines would be incorporated into construction documents and would conform to local, state,

[15] *Transit Noise and Vibration Impact Assessment*, Federal Transit Administration, May 2006

and federal statutes. Specific noise control measures would be reviewed during detailed engineering design and be negotiated as part of the construction permitting process. Noise specifications would be enforced through a program of field inspection and compliance review.

Mitigation for Construction-Period Impacts

MassDOT has indicated that every reasonable attempt would be made to minimize construction noise impacts. Construction noise control is accomplished by the use of quiet equipment with enclosed engines and/or high-performance mufflers and quieting procedures such as locating stationary construction equipment as far as possible from noise-sensitive sites. Noise guidelines would be incorporated into the construction documents and conform with local, state, and federal statutes. Specific noise control measures would be reviewed during detailed engineering design and be negotiated as part of the construction permitting process. Noise specifications would be enforced through a program of field inspection and compliance review.

Most of the track and bridge reconstruction would occur during the normal workday. Under special circumstances, where road or rail traffic interruptions have to be minimized, night work may occur. During these conditions, unusually noisy activities would be scheduled during daytime hours to minimize noise impacts to residential areas during periods of rest and sleep.

The station construction work would occur during the normal workday. Under special circumstances, when night work may occur, unusually noisy activities would be scheduled during daytime hours to minimize noise impacts to residential areas during periods of rest and sleep.

4.6.3.5 Summary of Impacts by Alternative

Table 4.6-22 summarizes the total number of moderate and severe noise impacts by alternative for the operations of the rail line. All of the severe noise impact locations were evaluated for noise mitigation measures.

The Stoughton Electric alternative (Stoughton, Southern Triangle - Fall River, and Southern Triangle - New Bedford segments) would result in 1,106 moderate and 341 severe impacts to residential receptors. The diesel operations would have similar impacts, with 1,085 moderate and 344 severe impacts.

The Whittenton Electric alternative (Stoughton partial, Whittenton, Southern Triangle - Fall River, and Southern Triangle - New Bedford segments) would result in 1,232 moderate and 381 severe impacts to residential receptors. The diesel operations would have lower impacts, with 1,228 moderate and 367 severe impacts.

Severe noise impacts typically result from the close proximity to locomotive and rail car noise and from locomotive warning horns, which must be sounded one-quarter mile prior all public grade crossings. Severe noise impacts result from Ldn noise exposure increases of 2 to 6 dBA (depending on existing). It should be noted that the majority of train horn impacts would occur at the same locations where rail operation impacts would occur. The train horn, however, is a uniquely different noise than the operations and was evaluated separately. A summary of these results can be found in Table 4.6-23. All of the severe noise impact locations were evaluated for noise mitigation measures.

Table 4.6-22 Summary of Projected Noise Impacts for South Coast Rail Alternatives

Alternative	Electric Alternative Moderate Impacts	Electric Alternative Severe Impacts	Electric Alternative Total	Diesel Alternative Moderate Impacts	Diesel Alternative Severe Impacts	Diesel Alternative Total
Stoughton						
Stoughton Line	404	159	563	330	128	458
Southern Triangle - Fall River Secondary	466	135	601	570	181	751
Southern Triangle - New Bedford Main Line	236	47	283	185	35	220
Total	**1,106**	**341**	**1,447**	**1,085**	**344**	**1,429**
Whittenton						
Stoughton Line*	359	164	523	279	109	388
Whittenton Branch/Attleboro Secondary	171	35	206	194	42	236
Southern Triangle - Fall River Secondary	466	135	601	570	181	751
Southern Triangle - New Bedford Main Line	236	47	283	185	35	220
Total	**1,232**	**381**	**1,613**	**1,228**	**367**	**1,595**

* Excludes the portion of the Stoughton Line that is bypassed by the Whittenton Alternative (south of Raynham Junction).

Table 4.6-23 Summary of Projected Train Horn Noise Impacts for South Coast Rail Alternatives

Alternative	Moderate Impacts	Severe Impacts	Total
Stoughton			
Stoughton	437	457	894
Southern Triangle - Fall River	98	164	262
Southern Triangle - New Bedford Main Line	93	76	169
Total	**628**	**697**	**1,325**
Whittenton			
Stoughton*	368	374	742
Whittenton	460	708	1,168
Southern Triangle - Fall River	98	164	262
Southern Triangle - New Bedford Main Line	93	76	169
Total	**1,019**	**1,322**	**2,341**

* Excludes the portion of the Stoughton line that is bypassed by the Whittenton Alternative (south of Raynham Junction).

Train horns along the Stoughton Alternative would have 628 moderate and 689 severe impacts. The Whittenton Electric Alternative would result in the train horns producing 1,019 moderate and

1,322 severe impacts. The Whittenton alternative results in the highest railroad grade crossing noise impacts.

4.6.3.6 Mitigation

Overview of MBTA Train Pass-by Noise Mitigation Policy

The need for noise mitigation in a specific location is determined based on the magnitude of the impacts and consideration of other factors such as feasibility, cost-effectiveness, and community views. The Corps does not have mitigation evaluation criteria for commuter rail projects and therefore relies on the guidance of the federal agency with special expertise in this area, the FTA. The FTA guidance requires consideration of mitigation for severe impacts and outlines the available mitigation options. FTA allows transit providers to develop local agency-specific noise mitigation policies detailing the analysis process and criteria for their projects. MBTA has developed a noise mitigation policy consistent with the FTA guidance, the details of which are described below.

The MBTA is committed to providing noise mitigation to the locations that meet or exceed the Severe Noise Impact Level. Noise mitigation measures would be provided to the extent that it is reasonably cost-effective. Where noise levels are projected to occur above the Severe Noise Impact Level, the MBTA may consider a reduced level of noise mitigation that is proportional to the level of impact over the threshold level and which, again is reasonably cost-effective.

The Severe Noise Impact Level is reached when the projected noise level from the project significantly exceeds the ambient noise level. These noise impacts are measured at the outside of the building, at the corner or wall closest to the tracks, at 5 feet above the ground. Where sensitive land uses such as residences (as defined in the FTA guidelines) are impacted at the Severe Noise Impact Level, the MBTA would provide noise barriers or other noise measures designed to reduce the noise impact, if cost-effective. Such measures would be considered cost-effective by the MBTA if the total cost of the wall or other measure is less than $30,000 per dwelling unit, and the wall is found to be effective in reducing noise levels below the impact threshold.

The MBTA would initially evaluate the severe impact locations to determine if a noise barrier can be provided. Where noise barriers are not cost-effective by the above standard, or where noise barriers cannot provide a sufficient level of noise reduction, the MBTA would consider providing funding for building noise mitigation. The cost-effectiveness limit for building noise mitigation would be $5,000 per dwelling unit per decibel of noise impact projected above the Severe Noise Impact Level (not to exceed $30,000 total). Thus, for example, if a dwelling unit is expected to have noise impacts 3 decibels (using the Ldn metric) above the Severe Noise Impact Level, the building noise mitigation measures would be funded not to exceed $15,000 in cost for that dwelling unit.

The $5,000 per dwelling unit per decibel figure was calculated by dividing the $30,000 total cost-effectiveness limit by 6 decibels, which is the typical difference between the “impact” threshold and “severe” impact level according to the FTA Manual.

The owners of properties that are affected by noise above the Severe Noise Impact Level, and who may be eligible for building noise mitigation under these guidelines, would be consulted during the design phase of the project. The MBTA would permit these homeowners to identify preferred building noise mitigation measures for their property from a list of potential measures that would be provided by the MBTA. The list would include measures such as window replacement or sound insulation in the house,

provided that the MBTA noise consultants determine that such measures are reasonably effective as noise reducing techniques in the context of the specific location involved. Where a homeowner elects to have work done on his or her property, he or she would be responsible for selecting the contractor and obtaining necessary permits, and the MBTA would pay the contractors bills from its own funds (thus avoiding the need for the homeowner to come "up front" with cash resources) up to the specified dollar limit for the particular location and noise condition involved. The list of eligible measures may also include reduced-height noise barriers or similar measures, subject to the cost-effectiveness limit, in cases where a homeowner judges that notwithstanding the lack of effectiveness of the reduced height structure, the homeowner prefers the psychological "space" created by the structure over the actual noise reduction achieved.

Similarly, homeowners in this category may elect, singly or in concert with other similarly affected homeowners, to install measures that may not reduce exterior noise levels, or may not be fully effective in reducing interior noise levels. Some of these mitigation measures, such as air conditioning (to allow residents to keep their windows closed when sleeping) may in fact increase both exterior and interior noise levels. As a result, however, there can be no guarantee that any particular level of noise reduction would be achieved based upon measures selected by the homeowner.

The MBTA's role would be limited to evaluating potential noise mitigation and paying for the installation of appropriate noise mitigation treatments. The homeowner would obtain guarantees for equipment or for workmanship from their contractors, and future replacement or maintenance would be the responsibility of the homeowner. Homeowners would be expected to enter into letter agreements with the MBTA acknowledging this understanding as a condition of proceeding with the installation of noise mitigation measures under these Guidelines.

Stoughton Electric Alternative Proposed Noise Mitigation Plan

This section presents a summary of the proposed noise mitigation measures for the severe noise impacts associated with the Stoughton Electric Alternative. Subsequent to the DEIS/DEIR, MassDOT conducted a noise impact analysis that re-evaluated the noise impacts associated with the changes in rail operations of the Stoughton Electric Alternative and identified severe noise impact locations. MassDOT's Noise Mitigation Plan evaluated the noise mitigation measures for these severe noise impact locations. The severe noise impact locations were evaluated to identify the potential noise mitigation measures, either noise barriers or building insulation in accordance with the MBTA noise mitigation policy described above. The location of the noise impact locations and proposed noise barriers are presented in Figures 4.6-4d through 4.6-4h; 4.6-5f through 4.6-5i; and 4.6-6a through 4.6-6g . A listing of the severe noise impact locations and their proposed noise mitigation measures are presented in Appendix 4.6-C. The following is a summary of the proposed noise mitigation measures by municipality.

Stoughton

The noise analysis identified 21 severely impacted noise sensitive receivers (Figures 4.6-6a-c). An evaluation of constructing a noise barrier indicated that due to the low density of these receptors, a noise barrier was not cost-effective for this area. Building insulation is the most cost-effective noise mitigation for the severely impacted noise sensitive receivers in Stoughton due to the distance between those noise impact locations.

Easton

The noise analysis identified 104 severely impacted noise sensitive receivers. The analysis determined that a noise barrier is the most cost-effective mitigation measure for the 23 severely impacted noise sensitive receivers located in the Center Street area (Figures 4.6-6b and 4.6-6d). The proposed noise barrier would be located parallel to Center Street and extend approximately from Main Street to Bridge Street. A noise barrier is also cost-effective for the 25 severe noise impacted locations located on Baldwin Street (Figures 4.6-6b and 4.6-6d). The proposed noise barrier would be located parallel to Baldwin Street and extend approximately from Bridge Street to Parker Terrace. Building insulation is the most cost-effective noise mitigation for the remainder of severely impacted noise sensitive receivers in Easton due to the distance between those noise impact locations.

Raynham

The noise analysis identified 23 severely impacted noise sensitive receivers (Figure 4.6-6f). Noise barriers are not cost-effective for the severe noise impact locations in Raynham due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Raynham.

Taunton

The noise analysis identified 23 severely impacted noise sensitive receivers (Figures 4.6-5f and 4.6-6g). Noise barriers are not cost-effective for the severe noise impact locations in Taunton due to the location and distance between the receivers. Building insulation is the most cost effective noise mitigation for all severely impacted noise sensitive receivers in Taunton.

Berkley

The noise analysis identified 14 severely impacted noise sensitive receivers (Figures 4.6-4d and 4.6-5f). Noise barriers are not cost-effective for the severe noise impact locations in Berkley due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Berkley.

Lakeville

The noise analysis identified 8 severely impacted noise sensitive receivers (Figures 4.6-5f and 4.6-5g). Noise barriers are not cost-effective for the severe noise impact locations in Lakeville due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Lakeville.

Freetown

The noise analysis identified 25 severely impacted noise sensitive receivers (Figures 4.6-5g, 4.6-5h, and 4.6-4d). Noise barriers are not cost-effective for the severe noise impact locations in Freetown due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Freetown.

New Bedford

The noise analysis identified 12 severely impacted noise sensitive receivers (Figure 4.6-5i). Noise barriers are not cost-effective for the severe noise impact locations in New Bedford due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in New Bedford.

Fall River

The noise analysis identified 111 severely impacted noise sensitive receivers (Figures 4.6-4d through 4.6-4h). The analysis determined that a noise barrier is the most cost-effective mitigation for the 16 severely impacted noise sensitive receivers located on the west side of the track in the Murray Street area (Figures 4.6-4f and 4.6-4g). The proposed noise barrier would extend approximately from Brightman Street to Cory Street. A noise barrier is also cost effective for the 14 severely impacted noise sensitive receivers located on the east side of the track in the Almy Street area (Figures 4.6-4f and 4.6-4g). The proposed noise barrier would extend approximately from Cory Street to President Avenue. Building insulation is the most cost-effective noise mitigation for the remainder of severely impacted noise sensitive receivers in Fall River.

Summary – Mitigation Commitments

The noise analysis identified four severely impacted noise sensitive areas that met MBTA's policy for a noise barrier. The noise analysis showed that a noise barrier would be the most cost-effective mitigation measure at the following locations:

- Barrier #1. Center Street area from Main Street to Bridge Street in Easton. This barrier would be approximately 1,700 feet long and cost $510,000. 23 residences with severe impacts would benefit, resulting in a cost of $22,174 per benefited residence.
- Barrier #2. Baldwin Street area from Bridge Street to Parker Terrace in Easton. This barrier would be approximately 1,700 feet long and cost $510,000. 24 residences with severe impacts would benefit, resulting in a cost of $21,250 per benefited residence.
- Barrier #3. Murray Street area from Brightman Street to Cory Street in Fall River. This barrier would be approximately 1,000 feet long and cost $300,000. 15 residences with severe impacts would benefit, resulting in a cost of $20,000 per benefited residence.
- Barrier #4. Almy Street area from Cory Street to President Avenue in Fall River. This barrier would be approximately 1,100 feet long and cost $330,000. 14 residences with severe impacts would benefit, resulting in a cost of $23,571 per benefited residence.

In total, 5,500 linear feet of noise barriers costing $1.65 million are proposed for the Stoughton Electric Alternative. The design details of the proposed noise barriers would continue to be refined in the final design process.

For the remaining severely impacted sensitive receptor locations, building insulation is the most cost-effective noise mitigation for reducing the noise impact associated with the rail operations along the Stoughton Electric Alternative.

Noise Mitigation for Other Alternatives

A detailed Noise Mitigation Plan has not been developed for the Stoughton Diesel, Whittenton Electric or Whittenton Diesel Alternatives. However, these alternatives result in noise impacts in many of the same locations as the Stoughton Electric Alternative and therefore noise barriers similar to those described for the Stoughton Electric Alternative would likely be feasible. As with the Stoughton Electric Alternative, building insulation would be used to address severe impacts in locations where noise barriers are not cost effective.

Train Horn Noise Mitigation

An option for reducing train horn noise impacts under FRA regulations (49 CFR Parts 222 and 22) would be to establish “quiet zones” at grade crossings. In a quiet zone, train operators would sound horns only in emergency situations rather than as a standard operational procedure because of safety improvements made to the at-grade crossings. Establishing a quiet zone requires cooperative action among the municipalities along the rail right-of-way, freight railroads and appropriate federal, state and local agencies. The municipalities are key participants as they must initiate the request to establish the quiet zone through application to FRA. In addition, to meet safety criteria, improvements are required at grade crossings; these may include modifications to the streets, raised medians, warning lights, four-quadrant gates and other devices. The FRA regulation also authorizes the use of automated wayside horns at crossings with flashing lights and gates as a substitute for the train horn. While activated by the approach of trains, these devices are pole-mounted at the grade crossings, thereby limit the horn noise exposure area to the immediate vicinity of the grade crossing. Although the establishment of quiet zones or the use of wayside horns would be very effective noise mitigation measure (eliminating all or nearly all horn noise impacts), considerable design analysis and coordination efforts would be required to determine if these measures are feasible. For NEPA purposes, the establishment of quiet zones is the recommended noise mitigation measure for horn noise impacts. However, this mitigation measure is dependent on actions by local governments in conjunction with numerous other government agencies and cannot be implemented by MassDOT or the Corps.

Unavoidable Noise Impacts

After the proposed noise mitigation measures (noise walls or building noise insulation) have been finalized, noise impacts may still be present. Noise walls can provide a maximum of approximately 10 dBA noise reduction, and usually protect only the yards and ground level floors. Building noise insulation (soundproofing) can provide 10 to 15 dBA of additional exterior-to-interior noise reduction, but does not mitigate exterior noise and the building’s windows must remain closed to maintain effectiveness.

4.7 VIBRATION

4.7.1 Introduction

This chapter describes the vibration analysis methodology, vibration assessment criteria, existing vibration levels, vibration impacts and mitigation measures.

4.7.1.1 Resource Definition

Ground-borne vibration, in the context of transit, refers to movement of the ground caused by train movements and is usually the result of interactions between the steel wheels of the locomotives and rail cars and the rail surfaces. Examples of such interactions (and subsequent vibration) include train wheels over jointed rail and untrue railcar wheel with “flats.” Unlike noise, which travels through the air, transit vibration typically travels along the surface of the ground. Depending on the geologic properties of the surrounding ground and the type of building structure exposed to transit vibration, the vibration propagation path between the track and the structure may be more or less efficient. Buildings with a solid foundation set in bedrock are “coupled” more efficiently to the surrounding ground and experience higher vibration levels than those buildings located in sandy soil.

Vibration induced by vehicle passbys is generally discussed in terms of displacement, velocity, or acceleration. However, human responses and responses by buildings and other objects are more readily described with velocity. Therefore, the average velocity (called the root mean square (RMS) velocity) is used to assess impacts associated with the human response to vibration (e.g. annoyance). The RMS vibration velocity levels are expressed in inches per second (ips) or vibration velocity levels in decibels (VdB). Vibration levels are referenced to 1-micro inch per second (mips).

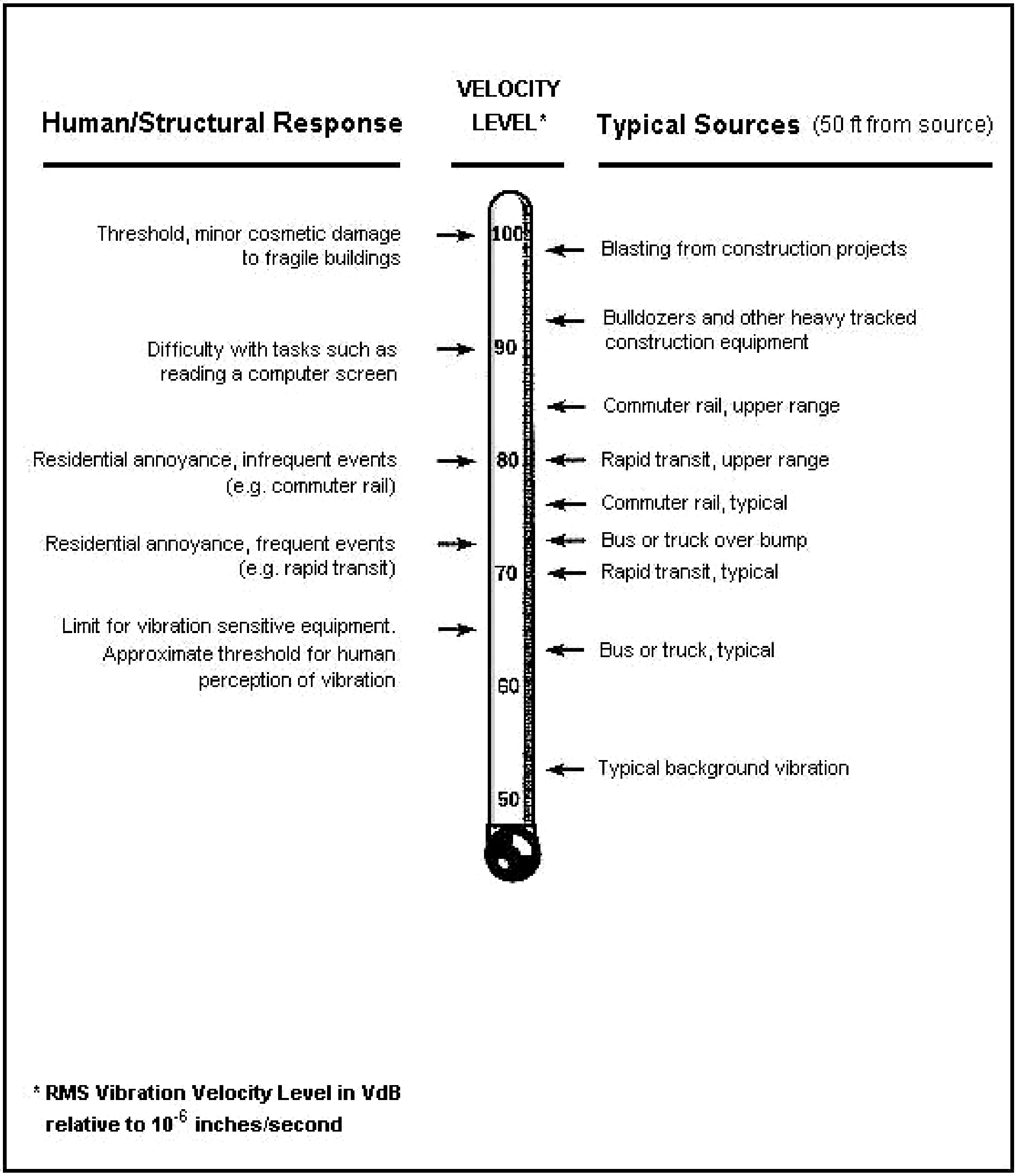
Typical ground-borne vibration levels from transit and other common sources are shown in Figure 4.7-1.

4.7.1.2 Regulatory Context

The vibration assessment for the South Coast Rail project was prepared in accordance with the FTA’s Transit Noise and Vibration Impact Assessment[1] guidance manual. The FTA guidance manual sets forth the basic concepts, methodology, and procedures for evaluating vibration levels from transit operations. There are no state or local regulations regarding vibration levels.

[1] FTA-VA-90-1003-06; May 2006.

Figure 4.7-1 Typical Ground-Borne Vibration Levels



4.7.2 Existing Conditions

Existing land uses in the study area are exposed to a variety of vibration sources ranging from trucks and vehicle passbys along local roadways, MBTA commuter rail train passbys along the existing rail corridors (Stoughton commuter rail line), and freight rail operations along the existing New Bedford and Fall River freight rail corridors.

A vibration measurement program was conducted in the study area to determine the existing vibration levels along the alignments of the various project alternatives. The vibration measurements were obtained using a CEL Model 593 meter with a PCB Model 393C accelerometer. The measured vibration levels consisted of a one-second interval time history of the train passby event reported in RMS velocity level in VdB relative to 1-micro inch per second.

Vibration was measured at four locations relevant to the Stoughton and Whittenton Alternatives in 1995 and 2008. These measured vibration levels are representative of the existing vibration levels along each of the proposed South Coast Rail alternatives. The vibration measurement locations and measured vibration levels are summarized in Table 4.7-1.

Actual vibration measurements were used to evaluate existing conditions because they provide a more accurate assessment of vibration along the South Coast Rail alternatives than would modeling based on generalized soils or geologic information. Some geologic conditions are associated with efficient propagation characteristics that result in higher than normal vibration levels. For example, shallow bedrock, less than 30 feet below the surface, is likely to have efficient propagation. Other factors that can be important are soil type and stiffness. In particular, stiff clay soils have been associated with efficient vibration propagation. Investigation of soil boring records can be used to estimate the depth to bedrock and the presence of problem soil conditions. Geological maps or subsurface borings may be used at a later stage in the project if more detailed analysis of ground propagation is needed for specific sensitive receptors.

Table 4.7-1 Vibration Measurement Locations and Measurement Results (VdB)

ID	Measurement Location	City/Town	Land Use	Distance (feet)	Train Operation	Train Speed (mph)	Measured Vibration Level (VdB)
	Southern Triangle – Common to All Build Alternatives						
1	Beechwood Road	Freetown	Residential	75	Freight	20	88
2	Chace Road	Freetown	Residential	100	Freight	20	85
	Stoughton Alternative/Whittenton Alternative						
8	Pine Street (Waterfall Hills Apartments)	Canton	Residential	80	Commuter	35	95
9	1508 Central Street	Stoughton	Residential	60	Commuter	20	86

Source: KM Chng Environmental Inc., 1995 and 2008.

4.7.2.1 Southern Triangle

In 1995, vibration measurements along the Southern Triangle were obtained in Freetown (location 1 – Beechwood Road and location 2 – Chace Road). The condition of the freight rail tracks in this section of the rail corridor constrained train speeds to approximately 20 mph. The measured vibration levels from

the freight rail operations ranged from 88 VdB at a distance of 75 feet at location 1, and 85 VdB at a distance of 100 feet at measurement location 2. The freight rail corridor consists of jointed track and rail cars with wheel flats, both of which contribute to higher vibration levels from freight operations. Since 1995, freight operations between New Bedford and Fall River have not changed. It was assumed therefore, that vibration along these corridors has not changed either. As a result, no new vibration measurements were obtained along these sections of the corridors during the 2008 vibration measurement data collection program.

Depending on the train speed, the condition of the vehicle wheels, and the ground propagation characteristics, the vibration levels at residences along the New Bedford and Fall River lines are expected to range from 85 to 95 VdB at a distance of 50 feet from the track, 78 to 88 VdB at a distance of 100 feet from the track, and 72 to 82 VdB at a distance of 200 feet from the track.

4.7.2.2 Stoughton/Whittenton Alternative

Vibration measurements were obtained along the Commuter Rail Stoughton Line as part of the 2008 measurement program. Vibration measurements were obtained at two locations, one in Canton (location 8 – Pine Street) and one near downtown Stoughton (location 9 – 1508 Central Street). As shown in Table 4.7-1, the measured vibration levels along this section of the Stoughton Line ranged from 86 VdB to 95 VdB at distances ranging from 60 to 80 feet from the tracks.

Vibration levels along the New Bedford Main Line (Weir Junction to Cotley Junction) are expected to range from 85 to 91 VdB at distances of 50 to 100 feet from the tracks. These vibration levels were not measured, but are expected to be similar to the freight rail vibration levels that were measured along the Southern Triangle. There are no train vibrations along the out-of-service segment of the corridor.

4.7.3 Analysis of Impacts and Mitigation

4.7.3.1 Introduction

This section addresses the vibration levels and potential impacts associated with the proposed commuter rail operations along the various corridor alignment alternatives. The remainder of this section describes the vibration analysis methodology, the assessment criteria, and the number and location of potential vibration impacts along each of the proposed alternative project corridors.

The Secretary's Certificate[2] required the DEIR to discuss consistency with applicable state and federal guidelines and regulations, and that the vibration impact assessment for the project alternatives identify impacted areas along the rail and bus routes and at the station sites. The Certificate further required the DEIR evaluate measures to avoid and minimize vibration impacts and include an assessment of impacts to wildlife.

The Secretary's Certificate on the DEIR, dated June 29, 2011, included the following requirements for the analysis of vibration.

[2] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form, South Coast Rail Project (EEA# 14346), April 3, 2009.

- "The FEIR should compare the estimated vibration levels to existing conditions and describe the actual change that will be experienced. This additional information should be provided for residential impacts along the Stoughton route as well as for historic buildings."[3]

- "The FEIR should include a mitigation plan with clear and specific commitments to address vibration impacts and an explanation of the reduction in VdB levels expected."

This section evaluates vibration impacts to residential and other buildings. Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*, considers potential vibration impacts to wildlife.

4.7.3.2 Vibration Assessment Criteria

Table 4.7-2 presents FTA's vibration impact criteria for various land use categories, as well as the frequency of events. The criteria are related to ground-borne vibration causing human annoyance or interfering with the use of vibration-sensitive equipment (e.g., medical imagery equipment, audio/visual recording equipment, scientific sensing and measuring equipment). No buildings with vibration-sensitive special equipment (Category 1) were identified in the inventory of land uses in the project area. All sensitive receptors, such as residences and schools within the project area fall under Land Use Categories 2 and 3. The criteria for acceptable ground-borne vibration are expressed in terms of RMS velocity levels in VdB and are based on the maximum levels for a single event (L_{max}). In addition, vibration criteria have also been established for other specific buildings such as concert halls, recording studios, auditoriums and theaters that are also contained in Table 4.7-2.

Table 4.7-2 FTA Ground-Borne Vibration Impact Criteria

Receptor Land use		RMS Vibration Levels (VdB)		
Category	Description	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
1	Buildings where low vibration is essential for interior operations	65	65	65
2	Residences and buildings where people normally sleep	72	75	80
3	Daytime institutional receptors	75	78	83
	TV/Recording Studios/Concert Halls	65	65	65
Specific Buildings	Auditoriums	72	80	80
	Theaters	72	80	80

Notes:
1 "Frequent Events" defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2 "Occasional Events" defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3 "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06, May 2006.

For the section of the project corridor between Stoughton Station and Myricks Junction, the total number of daily train operations is 40 (20 northbound trains and 20 southbound trains). As a result, the

[3] The vibration impact analysis was performed by determining the distance from the rail corridor within which a vibration impact is expected to occur, using the typical vibration analysis methodology defined in the FTA guidance manual. The specific existing vibration levels were not measured at each of the 369 potentially impacted receptors under the Stoughton Alternatives, although typical existing conditions vibration information is provided in Table 4.7-1.

FTA vibration impact criterion for occasional events was used to assess impacts along this section of the rail corridor. For residential receptors that experience occasional train events, the FTA vibration impact level is 75 VdB. Note that this approach to the vibration criteria differs from the DEIS/DEIR vibration analysis where an 80 VdB impact threshold was used for all areas.

For the section of the rail corridor between Myricks Junction and New Bedford, and Myricks Junction and Fall River, the total number of daily train operations is 20 for each of these lines (10 northbound trains and 10 southbound trains). As a result, the FTA vibration impact criterion for infrequent events was used to assess impacts along these sections of the rail corridor. For residential receptors that experience infrequent train events, the FTA vibration impact level is 80 VdB.

The vibration criteria in Table 4.7-2 do not take into account situations where vibration impacts occur under existing conditions. To address areas with existing vibration impacts, the FTA guidance manual presents additional criteria for projects along existing passenger rail or freight corridors.

- For heavily used rail corridors (defined as greater than 12 trains per day), the proposed project is considered to cause a vibration impact if it approximately doubles the number of vibration events per day or increases vibration levels by 3 VdB or more in comparison to the existing condition. For the South Coast Rail project, this criterion applies to the Stoughton Line north of Stoughton Station, and the Northeast Corridor.

- For existing rail corridors with infrequent use (defined as fewer than five trains per day), FTA recommends that the standard vibration impact criteria be used (Table 4.7-2). The Fall River Secondary and New Bedford Mainline in the Southern Triangle are examples of infrequently used rail corridors under FTA's definition.

Based on the FTA's guidelines for existing rail corridors, there would be no vibration impacts along the Northeast Corridor or the active Stoughton Line, since there would be no increase in the vibration levels from the project. Adding an additional track to the existing rail corridor that would move the trains approximately 20 feet closer to the residences along the rail corridor would result in an increase in vibration levels of less than 3 VdB. For example, a train locomotive traveling at 50 mph would generate a vibration level of 78 VdB at a receptor located at a distance of 100 feet from the nearest track. If an additional track were added to the rail corridor that moved the trains 20 feet closer to the receptor, the vibration level would be 80 VdB at a distance of 80 feet from the nearest track. Since the addition of the new track would not result in an increase in vibration level of more than 3 VdB, in accordance with the FTA's guidelines for an active rail corridor, there would be no appreciable vibration impact from the addition of the new track. However, a more detailed vibration analysis should be performed during final design when drawings showing the location of the proposed new tracks are available and can be used to determine the distance to the nearest receptors.

4.7.3.3 Impact Assessment Methodology

The vibration assessment was prepared in accordance with the FTA's Transit Noise and Vibration Impact Assessment[4] guidance manual. The FTA guidance manual sets forth the basic concepts, methodology and procedures for evaluating vibration levels from transit operations. Key inputs included the distance between the receptors and track, train operating speed, and adjustments accounting for special track work (turnouts, crossovers etc.), as well as the propagation of vibration into buildings.

[4] FTA-VA-90-1003-06; May 2006

None of the alternatives have the potential to result in vibration levels that could cause minor structural damage (such as cracks in plaster walls) (e.g. 100 VdB for fragile buildings). Therefore, the focus of the analysis is on human annoyance from vibration based on the FTA criteria.

Generalized Base Vibration Curve

The FTA vibration model combines various algorithms with empirically developed ground surface curves to estimate transit vibration levels at various distances from the track for average soil conditions. FTA surface vibration curves (adjusted for speed) were used to predict ground-borne vibration levels from transit operations at receptor locations along each of the project alternative corridors (Figure 4.7-2). In general, vibration levels increase at higher train speeds. The FTA model was used to determine the impact distance from the rail corridor within which the project transit vibration levels would exceed the FTA impact criteria. As shown in Figure 4.7-2, vibration curves are specified for locomotives, lighter commuter rail passenger cars, and rubber tired vehicles (buses).

The FTA guidance manual indicates that the vibration levels generated by both diesel and electric locomotives use the same upper curve shown in Figure 4.7-2. As a result, the vibration impact assessment for both the diesel and electric alternatives for the South Coast Rail project would be the same, assuming the same operating speed. To be conservative, the slightly faster electric commuter rail speeds were assumed for the vibration impact analyses.

Using the electric train speed data along each section of the rail corridor, an impact distance was determined using the locomotive vibration curve (adjusted for train speed). The relationship between impact distance and train speed for the FTA impact criteria of 75 VdB and 80 VdB are shown in Table 4.7-3. These impact distances were then used in conjunction with the aerial photographs to determine the number and location of the impacted residential receptors.

Table 4.7-3 Impact Distance vs. Train Speed, Electric Alternatives

Train Speed	Impact Distance[1] to 80 VdB	Impact Distance[1] to 75 VdB
100 mph	160 feet	250 feet
90 mph	140 feet	230 feet
80 mph	130 feet	210 feet
70 mph	115 feet	185 feet
60 mph	100 feet	165 feet
50 mph	85 feet	140 feet
40 mph	70 feet	115 feet
30 mph	50 feet	90 feet
20 mph	32 feet	60 feet

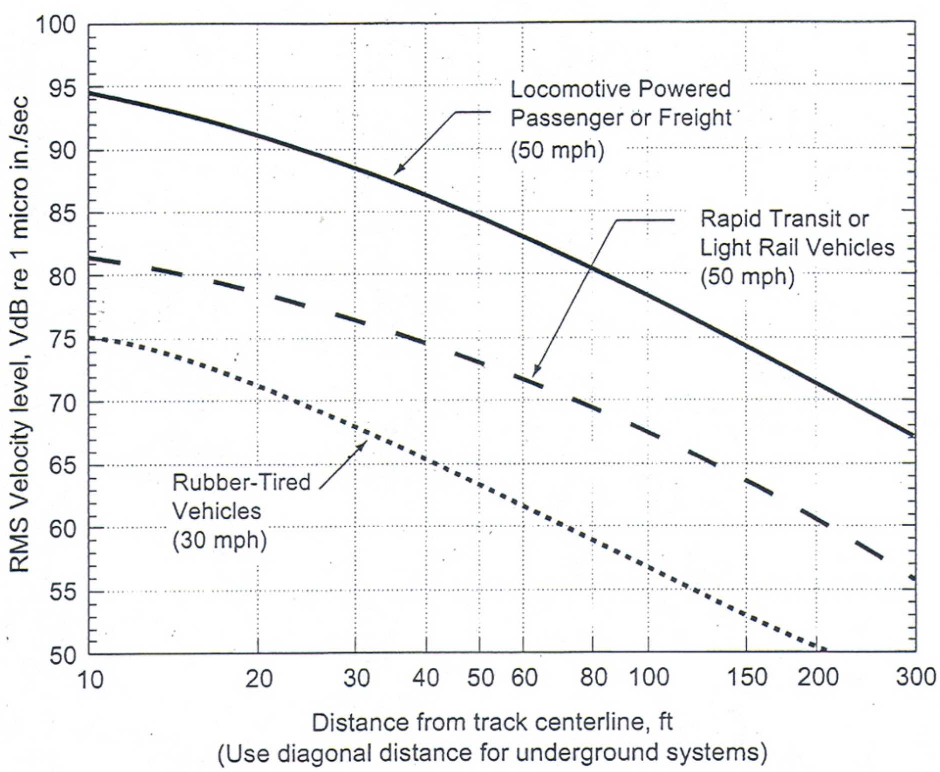
1 Distance from track centerline within which a vibration impact is expected to occur.

Ground Propagation

The vibration curves shown in Figure 4.7-2 are for generalized ground propagation characteristics. Although it is known that geographic conditions have a significant effect on vibration levels, it is rarely possible to develop more than a generalized assessment of the ground vibration propagation characteristics without a much more detailed vibration measurement program. For example, there are conditions where ground-borne vibration propagates much more efficiently than normal. Shallow

bedrock, less than 30 feet below the surface, is likely to have efficient propagation because much of the energy that would normally radiate down into the ground is reflected back towards the surface by the bedrock. The result is higher than normal ground surface vibration levels. Other factors that have an effect on vibration propagation are soil type and stiffness. In particular, stiff clay soils are also associated with efficient vibration propagation. However, the FTA recommends using the generalized ground propagation vibration curves in Figure 4.7-2 for Environmental Assessment and Environmental Impact Statement level analysis.

Figure 4.7-2 FTA Generalized Ground-Surface Vibration Curves



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, Washington, D.C., May 2006.

Special Trackwork

Trains traveling over switches or other special track work with gaps in the rail generate vibration levels that are 10 VdB higher than the levels indicated by the curves shown in Figure 4.7-2. For example, a locomotive traveling at a speed of 50 mph would generate a vibration level of 80 VdB at a distance of 80 feet from the tracks. A locomotive traveling at a speed of 50 mph over a switch would generate a vibration level of 80 VdB at a radial distance of approximately 225 feet from the switch. For the Build Alternatives, the vibration levels from switches located at each of the major junctions (Weir Junction, Myricks Junction, Cotley Junction, Whittenton Junction,) were evaluated, along with the switches associated with the proposed layover facilities.

The vibration impact assessment of the track switches along each of the project alternatives indicates that only one location has a receptor that is located within 225 feet of a switch that would result in a vibration impact of 80 VdB. A residential receptor on Ingell Street near Weir Junction would be exposed to a vibration level of 80 VdB during a train locomotive passby over the switch at Weir Junction. This impacted receptor is included in the vibration assessment for the Southern Triangle. No vibration impacts are expected to occur near any of the other switch locations associated with the other project alternatives.

Stations and Layover Facilities

At train stations and layover facilities, train-related vibration levels are generally significantly lower due to the slower train speeds. For example, a train traveling at a speed of 20 mph as it enters or leaves a train station would generate a vibration level of 80 VdB at a distance of 32 feet from the track. No vibration is generated while the trains are stopped at the stations. For a layover facility that has switches, a train traveling at 20 mph would generate a vibration level of 80 VdB at a radial distance of 100 feet from the switch. No vibration impacts were found at the two selected layover facilities (Weaver's Cove East and Wamsutta).

In the vicinity of the proposed train stations along each of the project corridors, acceleration and deceleration train speed profiles were used to account for trains stopping at the stations.

Track Condition

The vibration analysis assumed the use of continuous welded rail for each of the Build Alternatives. Continuous welded rail generates less vibration relative to other track configurations, such as jointed rail. In addition, since the heavier train locomotives generate higher vibration levels than the lighter passenger rail cars, the vibration analysis focused primarily on the vibration levels generated by the locomotives.

4.7.3.4 Impacts of Alternatives by Element

No-Build (Enhanced Bus) Alternative

The bus services added as part of the No-Build Alternative would not generate vibration levels sufficient to cause human annoyance assuming appropriate pavement maintenance over time.

Southern Triangle (Common to All Build Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all Build Alternatives. These rail lines form a rough triangular shape running south from Myricks Junction to Fall River (the Fall River Secondary) and from Weir Junction through Myricks Junction to New Bedford (the New Bedford Main Line), and are therefore referred to as the Southern Triangle. Although there is no commuter rail in the Southern Triangle, the existing tracks in this area are used by freight rail resulting in associated vibration levels under existing conditions, as described in Section 4.7.2.1.

As shown in Table 4.7-4, there are a total of 215 impacted receptors along the Southern Triangle section of the project corridor. The majority of the vibration impacts would occur in Fall River, where there is dense development in close proximity to the rail alignment. Eight of these impacted receptors are multi-unit apartment buildings and the rest are single-family homes. There are no institutional receptors or buildings with vibration sensitive equipment that would be impacted along the Southern Triangle. The general location of these impacted receptors (by municipality) is described in Table 4.7-5. Table 4.7-5 also shows the results of the vibration mitigation analysis for the impacted receptors along the Southern Triangle. The locations where ballast mats are recommended are shown in Figures 4.6-5f through 4.6-5i, and 4.6-4d through 4.6-4h in Chapter 4.6, *Noise* (the figures show both noise and vibration mitigation together to reduce the number of maps required).

Table 4.7-4 Summary of Potential Vibration Impacts—Southern Triangle

Segment	Municipality	Impacted Residences[1]
New Bedford Main Line -	Taunton	24
Weir Junction to Myricks Junction	Berkley	12
New Bedford Main Line -	Berkley	0
Myricks Junction to New Bedford	Lakeville	7
	Freetown	9
	New Bedford	10
Fall River Secondary	Berkley	8
	Lakeville	0
	Freetown	22
	Fall River	123
Totals		215

1 Impact = vibration levels equal to or greater than 80 VdB

Table 4.7-5 Potential Vibration Impacts by Sensitive Receptor—Southern Triangle

Segment	Municipality	Street	Impacted Receptors	Length of Ballast Mat	Cost at $180/ft.	Cost per Receptor	Cost Effective
Weir Junction to Myricks Junction	Taunton	Ingell Street	2	400 feet	$72,000	$36,000	No
	Taunton	Hart Street/	6	900 feet	$162,000	$14,730	Yes
	Taunton	Alegi Avenue	5				
	Taunton	Williams Avenue/	1	1150 feet	$207,000	$29,570	Yes
	Taunton	Plain Street	6				
	Taunton	Debra Drive/	3	1200 feet	$216,000	$54,000	No
	Taunton	Plain Street West	1				
	Berkley	Crabapple Drive/	2	550 feet	$99,000	$49,500	No
	Berkley	Cotley Street	1	200 feet	$36,000	$36,000	No
	Berkley	Padelford Street	3	500 feet	$90,000	$30,000	Yes
	Berkley	Mill Village Road	1	200 feet	$36,000	$36,000	No
	Berkley	Myricks Street/	2	1300 feet	$234,000	$46,800	No
	Berkley	Grove Street	3				
Myricks Junction to New Bedford	Lakeville	Malbone Street	1	200 feet	$36,000	$36,000	No
	Lakeville	Howland Street	3	900 feet	$162,000	$54,000	No
	Lakeville	Howland Street	3	900 feet	$162,000	$54,000	No
	Freetown	Braley Road	5	700 feet	$126,000	$25,200	Yes
	Freetown	Braley Road	3	600 feet	$108,000	$36,000	No
	Freetown	Chipaway Drive	1	200 feet	$36,000	$36,000	No
	New Bedford	Lynn Street	2	300 feet	$54,000	$27,000	Yes
	New Bedford	Purchase Street	6	700 feet	$126,000	$21,000	Yes
	New Bedford	Purchase Street	2	250 feet	$45,000	$22,500	Yes
Myricks Junction to Fall River	Berkley	Mill Street	6	900 feet	$162,000	$27,000	Yes
	Berkley	Adams Lane	2	250 feet	$45,000	$22,500	Yes
	Freetown	Richmond Road	3	500 feet	$90,000	$30,000	Yes
	Freetown	Richmond Road	2	400 feet	$72,000	$36,000	No
	Freetown	Colonial Drive	1	200 feet	$36,000	$36,000	No
	Freetown	Richmond Road	1	200 feet	$36,000	$36,000	No
	Freetown	Richmond Road	1	200 feet	$36,000	$36,000	No
	Freetown	Richmond Road	1	200 feet	$36,000	$36,000	No
	Freetown	Forge Road	4	600 feet	$108,000	$27,000	Yes
	Freetown	Elm Street	1	200 feet	$36,000	$36,000	No
	Freetown	Elm Street	2	450 feet	$81,000	$40,500	No
	Freetown	Green Lane/	3	1000 feet	$180,000	$45,000	No
	Freetown	Sampson Lane	1				
	Freetown	High Street/	1	300 feet	$54,000	$27,000	Yes
	Freetown	Alexander Drive	1				

Segment	Municipality	Street	Impacted Receptors	Length of Ballast Mat	Cost at $180/ft.	Cost per Receptor	Cost Effective
	Fall River	Leeward Road	9	1200 feet	$216,000	$24,000	Yes
	Fall River	Rolling Green Drive	3*	1100 feet	$198,000	<$30,000	Yes
	Fall River	North Main Street	19	2600 feet	$468,000	$24,630	Yes
	Fall River	North Main Street	1	200 feet	$36,000	$36,000	No
	Fall River	Wayland Street	2	250 feet	$45,000	$22,500	Yes
	Fall River	Alton Street	1	200 feet	$36,000	$36,000	No
	Fall River	North Main Street	13	1000 feet	$180,000	$13,850	Yes
	Fall River	Pickering Street/	3*	1000 feet	$180,000	$25,715	Yes
	Fall River	Clinton Street/	2				
	Fall River	St. James Street	2				
	Fall River	Murry Street/	17	2000 feet	$360,000	$7,350	Yes
	Fall River	Cory Street/	6				
	Fall River	Ballard Street/	3				
	Fall River	Almy Street/	9				
	Fall River	Railroad Avenue/	1				
	Fall River	North Court Street/	7				
	Fall River	Brownell Street/	4				
	Fall River	Thompson Street	2				
	Fall River	Dyer Street	3	400 feet	$72,000	$24,000	Yes
	Fall River	Durfee Street/	4	700 feet	$126,000	$18,000	Yes
	Fall River	Cedar Street	3				
	Fall River	Maple Street	2*	400 feet	$72,000	$18,000	Yes
	Fall River	Meadow Street	7	600 feet	$108,000	$15,430	Yes
Totals			215				

* This impacted receptor is a multi-unit apartment buildings.

Stoughton Alternatives

The Stoughton Alternatives (Electric and Diesel) would provide commuter rail service to South Station using the Northeast Corridor, Stoughton Line, New Bedford Main Line, and Fall River Secondary.

Along the Stoughton line between Stoughton Station and Weir Junction, the vibration assessment indicates that there are a total of 154 impacted receptors (see Table 4.7-6). Eight of these impacted receptors are multi-unit apartment buildings and the rest are single-family homes. The general locations of these impacted receptors (by street) are described in Table 4.7-7. Table 4.7-7 also shows the results of the vibration mitigation analysis for the impacted receptors along the Stoughton Line. The locations where ballast mats are recommended are shown in Figures 4.6-6a through 4.6-6g in Chapter 4.6, *Noise* (the figures show both noise and vibration mitigation together to reduce the number of maps required).

There are no institutional receptors or buildings with vibration sensitive equipment that would be impacted by the Stoughton Alternatives. In addition, the vibration levels at the Easton Historic Train

Station (which experienced train-related vibration in the past) and other historic buildings in Easton Village would be below the 100 VdB vibration threshold for the onset of minor structural damage (such as small cracks in plaster walls) to fragile and historic buildings.

Table 4.7-6 Summary of Potential Vibration Impacts—Stoughton Alternative (Diesel and Electric)

Segment	Municipality	Impacted Residences[1]
Stoughton Station to Weir Junction	Stoughton	22
	Easton	76
	Raynham	34
	Taunton	22
Total		154

1 Impact = vibration levels equal to or greater than 80 VdB

As discussed further in the methodology section, there would be no project related vibration impacts north of Stoughton Station.

Table 4.7-7 Potential Vibration Impacts by Sensitive Receptor—Stoughton Alternative

Segment	Municipality	Street	Impacted Receptors	Length of Ballast Mat	Cost at $180/ft.	Cost per Receptor	Cost Effective
Stoughton Station to Weir Junction	Stoughton	Brock Street	1	400 feet	$72,000	$24,000	Yes
	Stoughton	Washington Street	2				
	Stoughton	Rogers Drive/	8	1,200 feet	$216,000	$21,600	Yes
	Stoughton	Plain Street	2				
	Stoughton	Columbus Avenue	2	600 feet	$108,000	$54,000	No
	Stoughton	Smyth Street/	2	400 feet	$72,000	$24,000	Yes
	Stoughton	Washington Street	1				
	Stoughton	Morton Street/	1	800 feet	$144,000	$48,000	No
	Stoughton	Washington Street	2				
	Stoughton	Washington Street	1	200 feet	$36,000	$36,000	No
	Easton	Partridge Way	1	200 feet	$36,000	$36,000	No
	Easton	Mullen Lane	1	200 feet	$36,000	$36,000	No
	Easton	Linden Street/	1	700 feet	$126,000	$42,000	No
	Easton	Elm Street	2				
	Easton	Main Street	1	200 feet	$36,000	$36,000	No
	Easton	Center Street/	10	3,000 feet	$540,000	$20,770	Yes
	Easton	Williams Street/	2				
	Easton	Avis Circle/	1				
	Easton	Baldwin Street/	13				
	Easton	off Center Street	1	200 feet	$36,000	$36,000	No
	Easton	Tait Avenue	4	800 feet	$144,000	$36,000	No

Segment	Municipality	Street	Impacted Receptors	Length of Ballast Mat	Cost at $180/ft.	Cost per Receptor	Cost Effective
	Easton	Gary Lane	2	500 feet	$90,000	$45,000	No
	Easton	Laurel Drive	3	400 feet	$72,000	$24,000	Yes
	Easton	Short Street/	6	1,300 feet	$234,000	$23,400	Yes
	Easton	Lantern Lane	4				
	Easton	Depot Street	1	200 feet	$36,000	$36,000	No
	Easton	Purchase Street/	4	1,100 feet	$198,000	$33,000	No
	Easton	Granite Lane	2				
	Easton	Kennedy Circle	11	1,800 feet	$324,000	$29,455	Yes
	Easton	Prospect Street	3	400 feet	$72,000	$24,000	Yes
	Easton	Justin Drive	1	200 feet	$36,000	$36,000	No
	Easton	Foundry Street	2	400 feet	$72,000	$36,000	No
	Raynham	off Bridge Street	1	200 feet	$36,000	$36,000	No
	Raynham	Bridge Street	3	400 feet	$72,000	$24,000	Yes
	Raynham	Elm Street West	6	600 feet	$108,000	$18,000	Yes
	Raynham	Carver Street	2	250 feet	$45,000	$22,500	Yes
	Raynham	Britton Street	9	500 feet	$90,000	$10,000	Yes
	Raynham	Wampanoag Road/	5	2,100 feet	$378,000	$29,075	Yes
	Raynham	King Philips Street/	5				
	Raynham	Chickering Road	3				
	Taunton	Thrasher Street/	4	600 feet	$108,000	$15,430	Yes
	Taunton	Malcolm Circle	3				
	Taunton	Longmeadow Road	1	200 feet	$36,000	$36,000	No
	Taunton	Dean Street	1	200 feet	$36,000	$36,000	No
	Taunton	Summer Street	5	500 feet	$90,000	$18,000	Yes
	Taunton	High Street/	5*	1,200 feet	$216,000	$27,000	Yes
	Taunton	Paul Bunker Drive	3*				
Totals			154				

* This impacted receptor is a multi-unit apartment buildings.

Whittenton Alternatives

The Whittenton Alternatives (Electric and Diesel) would provide commuter rail service to South Station through Stoughton, connecting to the existing Stoughton Line using the Whittenton Branch through the City of Taunton.

The Whittenton Alternatives would result in 202 vibration impacts along the Stoughton Line, Whittenton Branch and Attleboro Secondary (see Table 4.7-8). Five of these impacted receptors are multi-unit apartment buildings on Bay Street in Taunton. The rest of the impacted receptors are single-family residences. There are no institutional receptors or buildings with vibration sensitive equipment that

would be impacted by the Whittenton Alternative. The general locations of the impacted receptors along the Attleboro Secondary and Whittenton Branch (by street) are shown in Table 4.7-9.

The vibration impacts along the Stoughton line in Stoughton, Easton, and Raynham are common to both the Stoughton and Whittenton Alternatives. The Whittenton Alternatives have greater total vibration impacts than the Stoughton Alternatives because of the dense development close to the Attleboro Secondary through downtown Taunton that is used by the Whittenton Alternatives, but not by the Stoughton Alternatives.

Table 4.7-8 Summary of Potential Vibration Impacts—Whittenton Alternative (Diesel and Electric)

Segment	Municipality	Impacted Residences
Stoughton Line	Stoughton	22
	Easton	76
	Raynham	12
Whittenton Branch	Raynham	5
	Taunton	12
Attleboro Secondary	Taunton	75
Totals		**202**

Table 4.7-9 Potential Vibration Impacts by Sensitive Receptor—Whittenton Alternative

Segment	Municipality	Street	Impacted Residences
Stoughton Line	See Table 4.7-7, for Brock Street in Stoughton to Carver Street in Raynham		110
Whittenton Branch	Raynham	King Philip Street	3
	Raynham	Regan Circle	2
	Taunton	Redwood Drive	3
	Taunton	Bay Street	5
	Taunton	Whittenton Street	4
Attleboro Secondary	Taunton	Edwards Avenue	6
	Taunton	Horton Street	14
	Taunton	Granite Street	1
	Taunton	Walnut Street	15
	Taunton	Cohannet Street	10
	Taunton	East Walnut Street	20
	Taunton	Weir Street	8
	Taunton	Weir Avenue	2
Totals			**202**

As discussed in the methodology section, there would be no project related vibration impacts north of Stoughton Station.

4.7.3.5 Temporary Construction Impacts

Typical vibration levels from construction equipment at a reference distance of 25 feet are: 104 VdB for an impact pile driver; 87 VdB for a bulldozer; 86 VdB for a loaded truck; and 79 VdB for a jackhammer. In general, if most construction activity is located more than 75 feet from the nearest sensitive receptors, the estimated vibration levels would be expected to be below the FTA annoyance criterion of 80 VdB. However, pile driving is the major impact device that generates the highest vibration levels during construction. Pile driving located within 50 feet of a building could result in vibration impacts, if pile driving is required for this project. At this distance, the vibration levels from pile driving would be below the onset of minor building damage (cracks in plaster walls) threshold of 100 VdB for fragile buildings. To get the vibration levels below the human annoyance level of 80 VdB, the pile driving activity would require approximately 175 feet from the nearest sensitive receptor.

Construction-period vibration impacts would be assessed for each alternative during the final design phase, when construction methods and the locations of specific types of construction equipment have been identified.

During construction, if pile driving is required, vibration impacts can be reduced by pre-augering the hole so that the actual impact driving of the pile would only occur during the last few feet of installation. Another mitigation measure is sonic or vibratory pile driving (93 VdB at 25 feet), where the pile is vibrated into the ground eliminating the need for an impact hammer. These measures for reducing vibration impact would be considered in the development of construction plans for areas where pile driving could be required in proximity to sensitive receptors.

4.7.4 Summary of Impacts

The results of the vibration impact assessment for each of the South Coast Rail alternatives are summarized in Table 4.7-10. This summary includes the vibration impacts from the Southern Triangle from Weir Junction to New Bedford and Fall River that are common to all Build Alternatives.

The Whittenton Alternatives result in 48 more impacted receptors than the Stoughton Alternatives, with the Attleboro Secondary segment of the Whittenton Alternatives being the primary cause of the greater impacts. The noted vibration levels reflect annoyance and would not rise to a level considered to cause structural damage.

Table 4.7-10 Summary of Potential Vibration Impacts without Mitigation by Alternative

Alternative	Impacted Residences
No-Build (Enhanced Bus) Alternative	0
Stoughton Alternatives	369
Whittenton Alternatives	417

4.7.5 Mitigation

4.7.5.1 Overview of MBTA Vibration Mitigation Policy

The need for vibration mitigation in a specific location is determined based on the magnitude of the impacts and consideration of other factors such as feasibility and cost-effectiveness. The U.S. Army Corps of Engineers does not have mitigation evaluation criteria for commuter rail projects and therefore

relies on the guidance of the federal agency with special expertise in this area, the FTA. The FTA guidance requires consideration of mitigation for vibration impacts and outlines the available mitigation options. FTA allows transit providers to develop local agency-specific noise and vibration mitigation policies detailing the analysis process and criteria for their projects.

MBTA has developed a noise mitigation policy consistent with the FTA guidance (See Section 4.6.3.6). The MBTA noise mitigation policy establishes a cost effectiveness criterion of $30,000 per dwelling unit. MBTA also utilizes this same cost effectiveness criterion ($30,000 per benefited receptor) for assessing potential vibration mitigation measures.

4.7.5.2 Stoughton Alternatives Vibration Mitigation Plan

Several mitigation measures were assumed to be incorporated in the project design and were included in the vibration modeling analysis:

- Continuously welded rail would be used to minimize vibrations caused by wheels impacting rail joints.
- Ballast (the crushed rock under the tracks) and sub-ballast (gravel base) would be placed to standard depths established by the MBTA to reduce transmission of vibration from the tracks to the ground.
- Turnouts would be located at least 100 feet away from homes and other sensitive buildings, to minimize higher vibration levels due to passage of wheels over the gap in turnout frogs.
- Trains and track would be maintained in such a manner as to minimize vibration generated by the trains, including regular wheel re-truing to eliminate wheel flats.

Additional mitigation measures, such as ballast mats (rubber mats placed under the ballast) would be provided where vibration mitigation is justified, and soil conditions are appropriate, as determined by on-site inspection of each potential mitigation location. Ballast mats can give vibration reductions of between 3 and 10 VdB. Ballast mats are very effective in attenuating frequencies of greater than 100 Hz found in vibrations near the source, and for track-receptor geometries traveling through dense soil and rock. They are not particularly effective at attenuating lower frequencies, especially those in the 10-30 Hz range found at distances greater than 60 feet and expected at sites with soft or sandy soil conditions. Therefore, a more detailed evaluation of the source-receiver soil conditions would be required during final design to assess the effectiveness of the ballast mat at impacted receptor locations along the corridor. Ballast mats cannot be installed within 50 feet of grade crossings; exact distances from each grade crossing would be determined at the time of final design.

The vibration analysis identified a total of 369 residences likely to be impacted by the Stoughton Electric Alternative. Based on the length of the ballast mat, and the cost of this mat at $180 per track foot, a mitigation price was determined for each receptor location. Any mitigation priced more than $30,000 per receptor was considered to not be cost-effective, based on the same MBTA cost-effectiveness criteria used for noise impacts (see Section 4.6.3.6). Those under $30,000 were considered cost-effective. Of the total impacted receptors, 296 (39 locations) were considered to be cost-effective for vibration mitigation. Approximately 33,350 linear feet of ballast mat would be required along the rail corridor at a cost of approximately $6,003,000. The locations of the proposed ballast mats for the Stoughton Electric Alternative are discussed by town below.

Stoughton

Ballast mats were considered cost-effective at three locations in Stoughton (Figures 4.6-6a and 4.6-6b):

- along Brock Street/Washington Street;
- along Rogers Drive/Plain Street; and
- along Smyth Street/Washington Street.

Easton

Ballast mats were considered cost-effective at five locations in Easton (Figures 4.6-6b, 4.6-6d, 4.6-6e):

- along Center Street/Williams Street/Avis Circle/Baldwin Street;
- along Laurel Drive;
- along Short Street/Lantern Lane;
- along Kennedy Circle; and
- along Prospect Street.

Raynham

Ballast mats were considered cost-effective at five locations in Raynham (Figure 4.6-6f):

- Bridge Street;
- Elm Street West;
- Carver Street;
- Britton Street; and
- Wampanoag Road/King Phillip Street/Chickering Road.

Taunton

Ballast mats were considered cost-effective at five locations in Taunton (Figure 4.6-6g):

- along Thrasher Street/Malcolm Circle;
- along Summer Street;
- along High Street/Paul Bunker Drive;
- along Hart Street/Alegi Avenue; and
- along Williams Avenue/Plain Street.

Berkley

Ballast mats were considered cost-effective at three locations in Berkley (Figures 4.6-5f and 4.6-4d):

- along Padelford Street;
- along Mill Street; and
- along Adams Lane.

Lakeville

Ballast mats were not considered cost-effective in Lakeville.

Freetown

Ballast mats were considered cost-effective at four locations in Freetown (Figures 4.6-5h and 4.6-4d):

- along Braley Road;
- along Richmond Road;
- along Forge Road; and
- along High Street/Alexander Drive.

New Bedford

Ballast mats were considered cost-effective at three locations in New Bedford (Figure 4.6-5i):

- along Lynn Street; and
- along Purchase Street.

Fall River

Ballast mats were considered cost-effective at eleven locations in Fall River (Figures 4.6-4d-h):

- along Leeward Road;
- along Rolling Green Drive;
- along North Main Street;
- along Pickering Street/Clinton Street/St. James Street;
- along Murry Street/Cory Street/Ballard Street/Almy Street/Railroad Avenue/North Court Street/Brownwell Street/Thompson Street;
- along Dyer Road;
- along Durfee Street/Cedar Street;

- along Maple Street; and
- along Meadow Street.

For the impacted receptor located within 225 feet of the switch at Weir Junction, "frogs" (sections of railroad track at a switch that guide rail car wheels from one track to the other) with spring-loaded mechanisms can be used rather than conventional frogs without spring-loaded mechanisms. The spring-loaded mechanism closes the gaps between the running rails. This substantially reduces the vibration emanating from switches and thus eliminates the impact at this receptor.

4.7.5.3 Whittenton Alternatives Vibration Mitigation Plan

Along shared segments, the vibration mitigation under the Whittenton Alternatives would be the same as described above for the Stoughton Alternatives (e.g. Southern Triangle and portion of Stoughton Line). Table 4.7-11 below presents the vibration mitigation analysis for the Whittenton Branch and Attleboro Secondary portions of the Whittenton Alternatives. A total of 6,300 feet of ballast mat costing $1,134,000 was found to be cost effective for these segments.

Table 4.7-11 Whittenton Alternatives Vibration Mitigation—Whittenton Branch/Attleboro Secondary

Municipality	Street	Impacted Receptors	Length of Ballast Mat	Cost at $180/ft	Cost per receptor	Cost Effective
Raynham	King Philip Street	3	400 ft	$72,000	$24,000	Yes
Raynham	Regan Circle	2	400 ft	$72,000	$36,000	No
Taunton	Redwood Drive	3	600 ft	$108,000	$36,000	No
Taunton	Bay Street	5	700 ft	$126,000	$25,200	Yes
Taunton	Whittenton Street	4	2,300 ft	$414,000	$103,500	No
Taunton	Edwards Avenue	6	1,200 ft	$216,000	$36,000	No
Taunton	Horton Street	14	1,700 ft	$306,000	$21,857	Yes
Taunton	Granite Street	1	200 ft	$36,000	$36,000	No
Taunton	Walnut Street	15	900 ft	$162,000	$10,800	Yes
Taunton	Cohannet Street	10	900 ft	$162,000	$16,200	Yes
Taunton	East Walnut Street	20	1,000 ft	$180,000	$9,000	Yes
Taunton	Weir Street	8	700 ft	$126,000	$15,750	Yes
Taunton	Weir Avenue	2	400 ft	$72,000	$36,000	No
Total for Cost-Effective Segments			6,300 ft	$1,134,000		

4.8 CULTURAL RESOURCES

4.8.1 Introduction

This chapter identifies the effects to cultural resources that may result from implementing each of the proposed South Coast rail alternatives. This section describes the potential impacts to identified cultural resources within the Area of Potential Effect (APE) defined for the alternatives, as well as steps that may be taken to avoid, minimize, or mitigate any adverse impacts to significant historic and archaeological properties. Impact analyses are based on numerous cultural resource identification surveys that have been completed to date for the alternatives. Background information on the proposed South Coast Rail alternatives is provided in Chapter 3, *Alternatives*. The alternatives are shown in Figure 4.8-1.

4.8.1.1 Resource Definition

For the purposes of this assessment, "cultural resources" refer to historic above-ground buildings, structures, and areas/districts and below-ground archaeological sites and archaeologically sensitive areas within and adjacent to the various components of the alternatives.

Direct impacts to historic resources could occur during the construction phase from the physical alteration of buildings, structures, and landscape or setting components within areas/districts, including demolition. Indirect impacts on historic resources could result during construction and/or operations from elevated noise or vibration levels, changes to the visual setting, increased traffic, or other environmental conditions affecting historic buildings, structures, and areas/districts. Direct impacts to archaeological resources could result from ground-disturbing construction activities in places where recorded/documented and under-documented pre-contact/contact Native American and post-contact EuroAmerican resources are or could be present.

4.8.1.2 Methodology

The Corps methodology is described in Appendix C, Procedures for the Protection of Historic Properties[1] of 33 CFR Part 325 - Processing of Department of the Army Permits (Appendix C). Appendix C identifies the procedures to be followed by the Corps to fulfill the requirements set forth in the National Historic Preservation Act (NHPA), other applicable historic preservation laws, and Presidential directives as they relate to the regulatory program of the Corps (33 CFR Parts 320-334).

The central concept in the Corps methodology is the "Permit Area," as defined in Appendix C. The term "permit area" as used in Appendix C means those areas comprising waters of the United States that will be directly affected by the proposed work or structures and uplands directly affected as a result of authorizing the work or structures. The following three tests must all be satisfied for an activity undertaken outside the waters of the United States to be included within the "permit area":

- Such activity would not occur but for the authorization of the work or structures within the waters of the United States;
- Such activity must be integrally related to the work or structures to be authorized within waters of the United States. Or, conversely, the work or structures to be authorized must be essential to the completeness of the overall project or program; and,

[1] AUTHORITY: 33 U.S.C. 401 et seq., 33 U.S.C. 1344, 33 U.S.C. 1413.

- Such activity must be directly associated (first order impact) with the work or structures to be authorized.

Pursuant to Appendix C, the Corps District Engineer must take into account the effects, if any, of proposed undertakings on historic properties both within and beyond the waters of the United States pursuant to Section 110(f) of the NHPA. The District Engineer, where the undertaking that is the subject of a permit action may directly and adversely affect any National Historic Landmark, shall, to the maximum extent possible, condition any issued permit as may be necessary to minimize harm to such landmark.

In addition to the requirements of the NHPA, all historic properties are subject to consideration under NEPA.[2] The Corps implements NEPA through the CEQ regulations in 40 CFR 1500-1588, its own NEPA regulations (33 CFR Part 325, Appendix B), and the Corps' public interest review requirements contained in 33 CFR 320.4.

In addition to the Corps' methodology for complying with the NHPA, the methodology based on the regulations of the Advisory Council on Historic Preservation 36 CFR 800.16(d), implementing Section 106 of the NHPA of 1966 are used by the Corps and Cooperating Agencies (USEPA, FRA, FTA and FHWA) in complying with the NHPA. The regulations of the Advisory Council on Historic Preservation 36 CFR 800.16(d) refer to the APE, which defines the areas in which a proposed undertaking may have an effect on an historic property, and the type of effect that may occur.

As defined in the Council's regulations, the APE for a project is the geographic area or areas within which an undertaking may directly, indirectly, or cumulatively cause changes in the character of historic properties that make them eligible for listing in the National Register of Historic Places (National Register), if any such properties exist [36 CFR 800.2(c)]. A direct impact APE is established to include the geographic area in which historic properties would be altered or otherwise used by construction activities or impacts related to project operations. An indirect impact APE typically consists of a larger area where auditory, pollution, noise, recreational visitor usage vibration, visual, and/or other types of environmental impacts resulting from an undertaking might affect the qualities for which a historic property is eligible for or listed in the National Register.

The South Coast Rail alternatives include 12 categories of potential work and operations types that may result in permanent or temporary and direct or indirect effects. The work types and operations expected for the project are:

- Increased train traffic on existing active track segments
- Minor repairs or rehabilitation of existing track in active use
- Constructing an additional track on an existing active track segment
- Restoring track and train traffic on out-of-service or abandoned rights-of-way
- Constructing commuter rail stations
- Constructing overhead catenary to allow electrified train service

[2] 42 U.S.C. 4321-4347.

- Layover and maintenance facilities
- Construction staging and laydown areas
- Operations noise and vibration (including horn blowing)
- Increased traffic queuing, intersection changes

These work types and operations may or may not be restricted to individual alternatives. Some of the proposed routes for the alternatives overlap and it is effective to look at track or corridor segments when defining the APE. Furthermore, an undertaking's APE may differ for above-ground resources (e.g., historic structures, buildings, and landscapes), below-ground resources (e.g., archaeological sites), and locations that are of traditional cultural significance to a particular individual or group including Native Americans (Traditional Cultural Properties or TCPs). Additional varying components of the project may result in more than one APE for the undertaking.

The various South Coast Rail project APEs were established by the Corps in terms of project alternatives and segments, work and operations (i.e., electrified and diesel) types, and resource class (see June 5, 2009 letter and final APE statement included in Appendix 4.8-A). The Massachusetts State Historic Preservation Office (SHPO) concurred with the Corps' definition of the South Coast Rail project APEs in a letter dated July 2, 2009.

The Wampanoag Tribe of Gay Head/Aquinnah indicated that the Hockomock and Pine swamps are regarded as traditionally culturally sensitive lands. These two swamps are located in the towns of Easton, Raynham, and Taunton, and may be affected by the Stoughton Alternative or Whittenton Alternative. The Mashpee Wampanoag Tribe and The Narragansett Indian Tribe may also be interested in these and other traditionally culturally sensitive lands. Should a location(s) of traditional cultural significance be identified within the project study area by individual(s) and/or groups, including the above federally recognized Indian Tribes, through the Corps' consultation with these groups, then the APE for such a location and its eligibility as a TCP would be determined through consultation between the Corps and the individual(s) and/or groups. The determination and treatment of any TCPs would be included in the Programmatic Agreement (PA) for the cultural resources of the South Coast Rail project. The Draft PA is included as Appendix 4.8-A.

Historic Resources Methodology

The South Coast Rail project would have direct and indirect, temporary and/or permanent, impacts on above-ground historic resources. Factors with potential to cause effects to historic above-ground properties that were considered in the definition of the APE for historic resources include:

- Atmospheric—resulting from trucks and machinery dust and exhaust during construction and train exhaust particulates during operation
- Noise—resulting from a variety of construction activities, and train wheels and horns sounding during operation
- Physical modification or demolition—changes to historic properties including bridges, culverts, and stations from actions including, but not limited to, noise insulation and barriers that alter historic buildings or their setting

- Traffic—changes in traffic patterns and traffic increases around grade crossings and stations
- Vibration—from construction activities and train pass-bys during operation
- Visual (setting)—changes to existing cultural landscape resulting from new construction (e.g., site preparation, signal and electrification equipment, grade crossings, new and modified bridges, right-of-way fences, noise walls, new and modified stations, new layover facilities, changes in land use, reduction of parcel sizes), vegetation clearing, and introduction of trains on corridors where service has been suspended since 1958; and cumulative impacts

The South Coast Rail project baseline APE for historic resources and for TCPs as defined by the Corps is summarized in Table 4.8-1. The areas listed in Table 4.8-1 encompass the direct APE, defined as the construction limits of the project, as well as the indirect APE. If a previously recorded or potential historic district or cultural landscape was identified, the APE would be broadened as necessary to encompass the boundary of the entire resource.

Direct impacts to historic resources were evaluated using preliminary engineering concept plans of project elements to identify the locations of historic buildings, structures, and areas/districts that are listed, determined eligible by the SHPO, or determined eligible for the National Register by the Corps in consultation with the SHPO within the APE for direct project impacts related to construction activities.

Indirect impacts to historic resources were evaluated by using environmental analyses for relevant impact categories including atmospheric, noise, traffic, vibration, visual, and cumulative impacts.

Table 4.8-1 APE Definitions by Work Types and Operations and Resource Class

Work Types and Operations	Below-ground	Above-ground	Traditional Cultural Properties
Rail corridors, baseline	Area of direct impact for proposed construction activities	800 feet (400 feet to either side of centerline) for electrification, 800 feet (400 feet either side of centerline) for diesel routes	To be determined in consultation with the Tribes
Stations (including stations, parking lots, access roads, and associated features)	Area of direct impact for proposed construction activities	250 feet from perimeter of proposed facility boundary	To be determined in consultation with the Tribes
Layover and maintenance facilities (lot only)	Area of direct impact for proposed construction activities	250 feet from perimeter of proposed facility boundary	To be determined in consultation with the Tribes
Construction laydown and staging areas (lot only)	Area of direct impact for proposed construction activities	250 feet from perimeter of proposed facility boundary	To be determined in consultation with the Tribes
Road, temporary and permanent access to proposed facility	Area of direct impact for proposed construction activities	400 feet from proposed road centerline	To be determined in consultation with the Tribes
Road, intersections	Area of direct impact for proposed construction activities	400 feet on either side of the intersection centerline	To be determined in consultation with the Tribes

Atmospheric

Atmospheric effects are considered in relation to USEPA and MBTA studies of emissions (nitrous oxide) and particulates (soot) from train diesel exhaust during operations that could potentially damage historic buildings. Air quality analyses have shown impacts to be minor for commuter rail lines and they are expected to be minimal for the South Coast Rail alternatives.

Noise

The analysis of noise impacts presented in Chapter 4.6, *Noise*, reports that properties could be impacted during service by changes in cumulative noise levels caused by train operations along the right-of-way and at layover facilities, and by warning horn blowing starting one-quarter mile prior to and at grade crossings. The FTA's noise impact criteria establish three levels of noise impacts, including no impact, moderate, and severe. These impact levels are calculated based on existing and projected new noise exposure, and the receptor and surrounding land use. Noise exposure at sensitive receptors along the rail right-of-way is expected to vary from 52 Ldn at locations up to 900 feet, to 70 or more Ldn at locations less than 125 feet from the track. Severe impacts are anticipated at locations where modeling predicts that the project noise exposure would exceed the sound levels in the FTA's noise impact criteria.

As identified in Chapter 4.6, *Noise*, the majority of noise sensitive receptors for the South Coast Rail alternatives within 1,000 feet of the rail corridor are single family and multi-family residences. The following definitions were used for the South Coast Rail alternatives per land use and receptors categories in FTA May 2006, pp 3-7, 3-8:

- Category 1 (quiet essential element for intended purpose): none (per FTA definition)
- Category 2 (buildings where people sleep): houses, inns, historic districts with houses (many in South Coast Rail project APE)
- Category 3 (institutional land uses with day and evening uses): schools, churches, libraries, lodges (a few in South Coast Rail project APE)
- Other sensitive historic categories with quiet settings:
    - Parks (passive and meditative)—per FTA are sensitive receptors (one in South Coast Rail project APE)
    - Cemeteries—not discussed in FTA report; however, historic cemeteries are places where a quiet setting is expected

Based on the noise analysis, transportation, industrial, commercial structures; parks with active recreational uses; and golf courses were not considered sensitive noise receptors.

Based on intensive survey level information and the generalized (not building by building) noise analysis, residences in historic districts with noise impacts would be affected. Noise level may have an effect on historic resources if noise increases reach the severe threshold at properties where a quiet setting is an important characteristic of National Register eligibility. There are five historic resources in the project APE where natural quiet is integral to the National Register setting. These are: Peirce and Haskins

Cemetery (PAL LA.024); North Burial Ground (PAL FR.K, FR.C); Neck of Land Cemetery (PAL Ta.029, Ta.C); Mount Pleasant Cemetery (PAL Ta.262); and the Blue Hills Multiple Resource Area (PAL De.A, Ca.E).

Noise may also affect an historic property if it is residential and if soundproofing measures such as barriers, insulated windows, or new doors are proposed that would affect the setting or appearance of the building or the setting of a district. Temporary noise from construction activities associated with utility relocation, grading, excavation, track and stations work, and installation of systems components is anticipated to be short term and to occur mostly during the day.

Physical Modification or Demolition

Physical modification or demolition to historic properties may occur from the application of noise proofing (discussed above); building demolition; bridge and culvert demolition, repair, and replacement; and the replacement or demolition of existing railroad infrastructure.

Traffic

Traffic impacts that could affect the setting of historic resources during operations include additional traffic around stations at certain times of day, and vehicle queuing at grade crossings or traffic control device during train pass-bys. Major changes in traffic could introduce or dramatically increase vehicles where none or few existed and/or alter access to and from historic properties by vehicles and pedestrians. Temporary traffic changes that could affect the setting of historic resources during construction would consist of the introduction of large machinery and vehicles, and redirected traffic. Potential impacts are analyzed in terms of traffic study thresholds to determine what, if any, locations are expected to have significant levels of impact. Traffic impacts to historic properties are expected to be minor for the South Coast Rail alternatives.

Vibration

The analysis of vibration impacts presented in Chapter 4.7, *Vibration*, shows that properties would be impacted by vibration where vibration levels reach 80 VdB or above. Based on the FTA Generalized Ground-Surface Vibration Curves Table included in the chapter, properties within approximately 90 feet of the center line of a locomotive powered passenger or freight rail line could be impacted by vibration levels of 80 VdB or more. Vibration may impact historic resources if the vibration levels are sufficiently high to result in structural damage to a building or structure, which is a threshold of 100 VdB for minor damage to fragile buildings. The vibration analyses for each of the diesel and electric alternatives indicate that the vibration levels from train pass-bys are below the threshold to cause structural damage to surrounding buildings or structures. It should also be noted that most of the buildings or structures eligible for inclusion in the National Register are in a context of functioning passenger and/or freight railroads in the past.

Temporary vibration from pile driving during construction could generate structurally damaging vibration levels of 104 VdB or more within 25 feet of the work site. This would be anticipated in the vicinity of certain bridges only.

Visual (Setting)

The analysis of visual impacts presented in Chapter 4.5, *Visual Resources and Aesthetic Resources*, provides information regarding the certain types of project work with new or substantially increased

(beyond what is already present) modern elements that could potentially change the setting of historic properties. Elements that may have a permanent effect on viewsheds and setting of historic resources include: new catenary, traction power facilities, and other electrification infrastructure; vegetation clearing and grading along new or improved rights-of-way; new grade crossing and signal shed equipment; traffic controls and road realignment; new right-of-way fences; noise walls; new or enlarged parking lots, new layover facilities and other site/landscaping work; and modification or demolition of existing buildings and structures, or new construction. Temporary visual effects may occur from construction staging areas. The quality of visual impacts is influenced by land contours and terrain, existing vegetation that remains, the view along streets not blocked by buildings, and the presence of intervening buildings. Introduction of new visual elements that are not out of character, either inherently or with mitigation measures applied, to the historic character of adjacent historic resources or areas would have low to moderate impacts. High impacts would occur where new visual elements are out of character with factors that qualify an historic property for inclusion in the National Register.

Cumulative

Cumulative effects are defined as the result of incremental effects of the project when added to other past, present, and reasonably foreseeable future actions. Cumulative effects on cultural resources are expected to be minor for the South Coast Rail alternatives. A description of indirect effects and cumulative impacts is provided in Chapter 5.

Archaeological Resources Methodology

The South Coast Rail project baseline APE for below-ground archaeological resources as defined by the Corps is described below.

The APE for archaeological resources is the direct APE where ground disturbances are planned for the construction of project elements. These elements include the active and inactive railroad right-of-way and active road right-of-way segments; new station locations; new layover/maintenance facility(s); and any other ancillary work areas and land takings identified as part of the alternatives.

Preliminary engineering concept plans of project elements (dated 2009) were used to determine if recorded archaeological sites and sensitive areas occurred within areas scheduled for direct impact. Concept plans were used to further inform on the direct project impacts to recorded archaeological resources and areas defined as archaeologically sensitive. In areas that were deemed archaeologically sensitive, intensive (locational) survey was conducted to identify archaeological sites within the APE so that potential adverse effects to archaeological resources could be assessed.

The scope of the intensive locational survey was established for the preferred alternative through consultation between the Corps and MassDOT. The intensive archeological survey was completed in April 2013 and conclusions of the intensive survey are summarized in this chapter. The Corps' Scope of Work also indicated that the proposed intensive archaeological subsurface testing was subject to change based on continuing Corps tribal consultations with federally recognized Indian Tribes. The intensive survey did not include archaeological testing for TCPs that may be identified for the project during the ongoing Corps tribal consultations.

Table 4.8-2 presents the proposed and actual subsurface testing conducted for the sensitive project rights-of-way and Stoughton Line stations summarized above in the intensive survey research design. The Corps' proposed testing methodologies for sensitive right-of-way areas were refined using

information provided in the 2012 supplemental reconnaissance survey for the Whittenton Alternative and the review of the current project conceptual design track and station plans depicting existing topography and limits of work areas for the Stoughton and Whittenton Alternatives. The subsurface testing included manually excavated test pits and machine assisted trenches.

Table 4.8-2 Archaeologically Sensitive Areas, Testing, and Results

Project Alternative	Sensitivity Assessment	Results of Intensive (Locational) Survey
Stoughton and Whittenton Alternatives	10 Areas	5 post-contact sheet refuse deposits not NR eligible 3 post-contact sites, 1 pre-contact site, not NR eligible 7 precontact sites, NR eligible
Stoughton Alternatives only	3 Areas	2 post-contact sheet refuse deposit, not NR eligible 3 precontact sites, NR eligible
Whittenton Alternatives only	2 areas	4 pre-contact sites NR eligible

4.8.2 Existing Conditions

4.8.2.1 Historic Resources

The historic resources discussed in this section are the properties determined eligible for listing in the National Register by the Corps in consultation with SHPO. The characterization of existing conditions was undertaken in two phases of historic survey, along with supplemental survey information and National Register determinations by the Corps and SHPO. An initial historic resources reconnaissance survey was conducted that included the Stoughton Alternatives followed by supplemental surveys which included the Whittenton Alternatives as well as additional survey information on the Stoughton Alternatives. The reconnaissance surveys were designed to identify historic resources that may be eligible for listing in the National Register and previously designated historic properties that are listed in, determined eligible for, or considered by the SHPO to be eligible for inclusion in the National Register. The subsequent intensive survey collected information on potentially National Register-eligible historic resources and produced recommendations for eligibility. This section presents the results of the intensive survey for the Stoughton and Whittenton Alternatives (Appendix 4.8-B) and the determinations of National Register eligibility made by the Corps and the SHPO in their review of the intensive survey results and recommendations. A summary of historic properties subject to consideration for project effects is in Table 4.8-3. The Whittenton Alternatives are the same as the Stoughton Alternatives, except that it proposes to use the Whittenton Branch of the Stoughton Line. Historic properties associated only with the Whittenton Alternatives are located only in Taunton, and are discussed separately in the discussion of properties in Taunton. Properties surveyed for the Stoughton Alternatives only are identified as such in the following discussion; these properties are in Raynham (one property) and Taunton (nine properties).

The intensive survey for the Stoughton Alternatives identified areas/districts and individual properties within the APE for the rail corridor and proposed stations that meet any of the following characteristics:

- Properties listed in the National Register
- Properties previously determined eligible by the Massachusetts SHPO for listing in the National Register
- Properties eligible for listing in the National Register

- Designated National Historic Landmarks (NHL)

Table 4.8 3 presents a summary of the historic resources identified for the Stoughton and Whittenton Alternatives that were previously listed in or determined eligible for listing in the State and National Registers. One property, the Quechechan River Bridge in Fall River has been determined eligible through consensus by the SHPO and MassDOT since the DEIS/DEIR survey, and has therefore been added to this group. A summary of the number of identified historic properties in each category—NHL, National Register listed, or National Register determined eligible—is presented in Table 4.8 3.

Table 4.8-3 Summary of Historic Resources

Project Location	Resource Type	NR Eligible *	NR Listed or Previously Determined Eligible**	Not Eligible, Demolished or Out of APE*
Canton	Areas/Districts	2	1	1
	Individual	3	2	0
Stoughton	Areas/Districts	1	0	0
	Individual	3	3	1
Easton	Areas/Districts	4	2 [1 NHL]	0
	Individual	1	1	0
Raynham	Areas/Districts	1	0	1
	Individual	2	0	0
Taunton	Areas/Districts	7	4	2
	Individual	2	22	6
Berkley	Areas/Districts	1	0	0
	Individual	1	0	0
Lakeville	Areas/Districts	1	0	0
	Individual	1	0	1
Freetown	Areas/Districts	1	1	0
	Individual	1	1	0
New Bedford	Areas/Districts	1	2	1
	Individual	6	3	1
Fall River	Areas/Districts	3	9	2
	Individual	10	11	3
TOTAL		52	62	19

* Historic Resources Intensive Survey, Evaluation and Effects, Table 4-2 (May 2013)
** Historic Resources Intensive Survey, Evaluation and Effects, Table 3-2 (February 2013)

The following summary addresses those historic resources that are listed in or determined eligible for the National Register, by the SHPO, for the rail corridors and stations in these two alternatives.

Lists of these properties are provided for each alternative, indicating their association with a proposed or existing station as defined by the project or a grade crossing identified on the project base maps. These lists are included in the Historic Properties Intensive Survey included as Appendix 4.8-B. The results are based on archival research and walkover surveys of project elements new to the South Coast Rail alternatives, as well as updates to previous assessments of project elements for the Stoughton Alternatives of the New Bedford/Fall River Commuter Rail Extension Project conducted in 2001. The

results of these tasks are summarized below by project alternative and town. The surveyed properties discussed below are mapped on Figures 4.8-2 through 4.8-16, and are labeled according to "Map No." These resources are described in greater detail in the Cultural Resources Reconnaissance Survey, Volumes III and IV and the Historic Resources Intensive Survey, Evaluation and Effects.

Stoughton Alternatives

The Stoughton Alternatives (diesel and electric) consist of the Stoughton Line (active and inactive CSX and commuter) railroad right-of-way, a short section of the Attleboro Secondary (active CSX) railroad right-of-way, six proposed stations (North Easton, Easton Village, Raynham Park, Taunton [Dean Street], and Taunton Depot and Stoughton), and two existing stations (Canton Center, and Canton Junction). The Whittenton Alternatives (diesel and electric) use the Whittenton Branch (inactive) railroad right-of-way and the Attleboro Secondary between Whittenton Junction and Weir Junction. One alternate station is associated with the Whittenton Alternatives, the Dana Street (Taunton) Station. All alternatives (Whittenton and Stoughton) use the Southern Triangle, including the New Bedford Mainline and the Fall River Secondary.

The Stoughton/Whittenton Alternatives results are discussed below from north to south by community, station site, and layover facility/traction power site. The surveyed properties discussed below are mapped in Figures 4.8-2 through 4.8-16.

Canton

Approximately 2.3 miles of the Stoughton Line rail right-of-way, one traction power facility, and two existing stations (Canton Junction Station and Canton Center Station), are located within Canton as part of the Stoughton Alternatives. The Stoughton Line rail corridor in Canton is not National Register-eligible.

The following historic properties located along the Stoughton Line in Canton are eligible for National Register listing. The Canton Junction Railroad Station (Map No. Ca.001) is a Richardsonian Romanesque style, granite and red sandstone building erected in 1892 that is located at 666 Sherman Street, immediately east of the Stoughton Line at the point where it diverges from the Amtrak Northeast Corridor. The Revere Copper Company Railroad Embankment (Map No. Ca.002) is a linear earth mound feature with a single stone culvert from 1835 that is set in a wooded area south of Canton Junction, between the Stoughton Line and Amtrak's Northeast Corridor. The Revere Copper Company Works Area (Map No. Ca.B) is a 33-acre, multiple-building, active industrial complex purchased by Paul Revere in 1801, that is located 800 feet southwest of the Stoughton Line at 104 Revere Street. A portion of the original Revere Copper Company lot line, which is currently used as a parking lot, extends into the APE. The area was the site of the first copper rolling mill in the United States. The Washington Street Commercial and Institutional Area (Map No. Ca.C) is a neighborhood of approximately 55 commercial, civic, and residential buildings centered on Washington Street that straddles the Stoughton Line between Church Street to the south and Chapel Street to the north. It encompasses the Canton Center Area (Map No. Ca.H) and the Canton Public Library (Map No. Ca.006). The library is a cruciform-plan, limestone and brick, Classical Revival style building constructed in 1901 that is located at 786 Washington Street, approximately 600 feet north of the Stoughton Line. The Forge Pond Railroad Bridge (Map No. Ca.007) carries the Stoughton Line over a short waterway connecting Forge Pond and Kinsley Pond and is a single span stone arch and reinforced concrete bridge built between 1845 and 1890. The Canton Water Works (Map No. Ca.024) is a Romanesque-style industrial building constructed circa 1835 that is located at 44 Pine Street approximately 100 feet northeast of the Stoughton Line.

One traction power facility is proposed within Canton as part of the Stoughton Alternatives.

- TP-02, Switching Station (SWS-1) is located near a late-twentieth century residential subdivision, with a proposed access road that would extend through the driveway of an industrial loft (not eligible). A National Register-eligible stone and concrete arch Forge Pond Railroad Bridge (Ca.007), constructed between 1845 and 1890, is located to the northeast of TP-02.

Stoughton

Approximately 4.1 miles of the Stoughton Line rail right-of-way with one existing and one proposed station are located within Stoughton as part of the Stoughton Alternatives. No proposed traction power sites are within Stoughton as part of the Stoughton Alternatives. The existing Stoughton Station is located at Wyman Street and the proposed North Easton Station site is located in Stoughton at the town boundary with Easton. The Stoughton Line rail corridor in Stoughton is not National Register-eligible.

The following historic properties are located along the Stoughton Line in Stoughton. The Downtown Stoughton Area (Map No. St.B) radiates out from Stoughton Station and consists of approximately 386 properties developed with civic, commercial, industrial, and residential buildings between the mid-19th through the mid-twentieth century. The area is eligible for National Register listing. The Pearl Street Cemetery (Map No.St.022) is the oldest burial ground in Stoughton and is located approximately 1,100 feet northeast of the Stoughton Line near the town center. It consists of a 1.6-acre lot with approximately 400 burial markers from 1737 to 1965 and is eligible for National Register listing. The Stoughton Town Hall (Map No. St.023) is a Romanesque Revival style building constructed in 1881 that is located at 10 Pearl Street, approximately 400 feet northeast of the Stoughton Line and 600 feet from Stoughton Station. It has been determined eligible for National Register listing. The Mystic Rubber Company Building (Map No. St.024) is a brick mill loft constructed in 1877 that is located at 2 Canton Street, on the southwest side of the Stoughton Line near Stoughton Station and the Wyman and Porter street railroad crossings. It is eligible for National Register listing. The Stoughton Old Colony Railroad Station (Map No. St.025) is a National Register-listed Romanesque Revival style granite building constructed in 1888 that is located at 45-47 Wyman Street, near the Wyman Street railroad crossing serving the Stoughton Line. The Lucius Clapp Memorial Library (Map No. St.026) is a National Register-listed Classical Revival style brick building constructed in 1903 that is located at 6 Park Street, approximately 600 feet northeast of the Stoughton Line at Stoughton Station and the Wyman Street crossing. The Meade Rubber Company Building (Map No. St.046) is a brick mill loft constructed in 1916 that is located at 25 Brock Street on the west side of the Stoughton Line and an existing layover facility, and adjacent to the Brock Street railroad crossing. It is determined as eligible for National Register listing.

Stoughton (Proposed Station)

The proposed relocated Stoughton Station is not within any National Register Historic District or Area, and is south of the downtown Stoughton area (eligible for listing). The site contains one property that has been determined eligible for listing in the National Register: the Meade Rubber Company Building (MHC No. STG.1) at 25 Brock Street. The building is a two-story brick mill loft constructed in 1916 with arched window openings and brick piers. The company manufactured shoe heels and soles as well as rubberized fabrics for use in hospital sheets. Meade Rubber Company was one of several companies engaged in the rubber fabric industry in Stoughton in the early twentieth century. The Meade Rubber Company Building is potentially eligible for National Register listing at the local level under Criteria A and

C for its associations with the locally significant rubber industry as an intact example of an early twentieth century industrial loft. The proposed relocated station would require that this building be demolished, resulting in an adverse effect.

Easton

Approximately 6.6 miles of the Stoughton Line rail right-of-way, two traction power sites and one station, the Easton Village Station, are located in Easton as part of the Stoughton Alternatives. The Stoughton Line rail corridor is not National Register eligible, with the exception of approximately 2,000 feet of the Stoughton Line that is part of the Dighton and Somerset/Old Colony Railroad, Fall River Line Railroad Corridor (Map No. Ea.A) right-of-way that extends through the existing North Easton National Register Historic District. This portion is National Register-eligible as a contributing element of the historic district.

The following historic properties located on the Stoughton Line in Easton are listed in the National Register. The H.H. Richardson Historic District of North Easton (Map No. Ea.D) is a noncontiguous NHL district of five properties containing Richardson Romanesque style buildings designed by Henry Hobson Richardson. The Oliver Ames Free Library (1877) and Oakes Ames Memorial Hall (1879) are located on Main Street, approximately 400 feet west of the proposed Easton Village Station on the Stoughton Line. The Old Colony Railroad Station (1881) is located immediately north of the proposed station and directly abutting the rail right-of-way. The two remaining structures that comprise the NHL are outside the APE. The North Easton Historic District (Map No. Ea.B) encompasses the Stoughton Line between Main and Elm streets, and the proposed Easton Village Station. The district is listed in the National Register and includes approximately 160 buildings and six landscapes that date from the late eighteenth to the early twentieth century, including the Ames Company Shovel Shop complex located adjacent to the proposed Easton Village Station. The Stoughton Line right-of-way (Map No. Ea.A) track structure—including bridges, cuts and fills; retaining walls; and signal infrastructure—is important to the setting of this district. The Old Colony Railroad Station (Map No. Ea.003), located on the east side of the Stoughton Line between the Oliver Street grade crossing to the north and the proposed Easton Village Station to the south, is an H.H. Richardson Richardsonian Romanesque granite and brownstone building constructed in 1881. The station is individually listed in the National Register and is a contributing property to the H.H. Richardson Historic District NHL and the North Easton Historic District.

The following historic properties located on the Stoughton Line in Easton are eligible for National Register listing. The Holmes-Linden Street Area (Map No. Ea.C) encompasses approximately 400 feet of the Stoughton Line and consists of approximately 78 simple, wood-frame residences constructed in the mid- to late-nineteenth century to house laborers employed at the Ames Shovel Works and nearby shoe factories. The Center Street Area (Map No. Ea.E) encompasses approximately 0.5 mile of the Stoughton Line and includes approximately 343 wood-frame houses that demonstrate the expansion of North Easton out from its center at the Ames Company Shovel Shop complex from the early nineteenth to the early twentieth century. The Easton Center Area (Map No. Ea.F) encompasses approximately 0.5 mile of the Stoughton Line right-of-way and includes 120 civic and residential buildings from the late eighteenth through the twentieth centuries. The Hayward-Pool Area (Map No. Ea.G) abuts approximately 1,000 feet of the Stoughton Line at its west edge. It contains residences, a cranberry bog with associated agricultural buildings, and a burial ground developed between 1778 and 192. The Stoughton Line: Dighton and Somerset/Old Colony Railroad, Fall River Line Railroad Corridor (Map No. Ea.A) is an inactive section of the Stoughton Line right-of-way, originally constructed in 1866. Because of the poor integrity and condition of the Stoughton Line corridor, it is not as eligible for the National Register as an

independent historic district. However, the 2,000 foot-long portion of the Stoughton Line railroad right-of-way within the North Easton Historic District (MHC Nos. EST.E and EST.B) between Main and Elm streets is eligible for the National Register as a contributing element to the existing North Easton Historic District.

Two proposed traction power sites are located in Easton as part of the Stoughton Alternatives.

- TP-03, Paralleling Station (PS-1) is located south of the proposed North Easton Station, near a shopping center and contemporary residential subdivisions. No National Register listed or eligible historic properties have been identified in the APE.

- TP-04, Substation (TPSS-1) is located in a forested area near Hockomock Swamp. One National Register eligible historic property has been identified in the APE.

Raynham

Approximately 4.9 miles of the Stoughton Line and 1.2 miles of the Whittenton Branch rail rights-of-way, along with one proposed station, the Raynham Park Station, are located within Raynham as part of the alternative. The Raynham Park Station is on the Stoughton Line near the Easton town boundary. There are no proposed traction power sites in Raynham. The portion of the Stoughton Line rail right-of-way corridor located in Raynham is not National Register eligible.

The following properties along the Stoughton Line and Whittenton Branch in Raynham are eligible for National Register Listing. The Carver Street Area (Map No. Ra.B) is located on the east side of the Stoughton Line at the Carver Street railroad crossing and consists of six civic, religious, and residential properties constructed between 1865 and 1905. The Broadway-Center Street Area (Map No. Ra.C), which is centered on Broadway (State Route 138), encompasses portions of the Stoughton Line and abuts the west side of the Whittenton Branch. The area includes residential, commercial, and civic properties constructed between approximately 1860 and 1960. The Dog Kennel and Track Property (Map No. Ra.011) is located at 385 Thrasher Street along the east side of the Stoughton Line near the Britannia Street railroad crossing and the Taunton city boundary. It includes a wood-frame farmhouse constructed circa 1870, a fenced kennel and dog run complex, and a large, oval dirt track with an announcer’s podium that abuts the railroad.

The property at 521 (formerly 87) Prospect Hill Street (Map No. Ra.001) is a farmstead that extends between Prospect Hill Street and the west side of the Stoughton Line, and includes a wood-frame house constructed circa 1890 and several outbuildings. The property is eligible for listing in the National Register.

Approximately 0.7 mile of the New Bedford Main Line rail right-of-way extends through Taunton. There are no properties listed in, or determined as eligible for the National Register along the New Bedford Main Line in Taunton. Approximately 2.0 miles of the Stoughton Line is located within Taunton as part of the Stoughton Alternatives, as well as approximately 1.6 miles of the Attleboro Secondary rail right-of-way between Weir Junction and Cotley Junction that connects the Stoughton Line to the New Bedford Main Line. Two new stations are proposed in Taunton for the Stoughton Alternatives: Taunton (Dean Street) and Taunton Depot, as well as one traction power site (TP-05, Paralleling Station PS-2). The portion of the Stoughton Line rail corridor located in Taunton has been determined not eligible for the National Register.

The Taunton Multiple Resource Area (MRA) (Map No. Ta.C) includes five National Register Historic Districts and 87 properties individually listed in the National Register, which are located within the city limits of Taunton. The South Coast Rail project APE encompasses one historic district and 10 individual properties included in the Taunton MRA.

The following properties located between the Raynham town boundary and the junction of the Stoughton Line with the Attleboro Secondary are listed in the National Register. These properties are all within the Taunton Center Area (Map No.Ta.B, see below). The Dean-Hartshorn House (Map No. Ta.018, Ta.C) is a Georgian style building constructed circa 1798 that is located approximately 600 feet east of the Stoughton Line at 68 Dean Street. The Old Colony Railroad Station (Map No. Ta.019, Ta.C) is a brick structure constructed in 1876 that is located on the west side of the Stoughton Line between the Dean Street railroad crossing and the proposed Dean Street Station. The William Woodward House (Map No. Ta.020, Ta.C) is a Federal style house constructed circa 1830 that is located at 117 Arlington Street, approximately 200 feet west of the Stoughton Line, near the Dean Street crossing and the proposed Dean Street Station. The house was originally located on Dean Street, where it was used as a depot by the Old Colony and Newport Railroad from 1866 to 1881. The Charles R. Atwood House (Map No. Ta.021, Ta.C) is an Italianate style, wood-frame building constructed circa 1850 that is located at 30 Dean Street, approximately 400 feet west of the Stoughton Line near the Dean Street railroad crossing. The Theodore Dean House (Map No. Ta.022, Ta.C) is a wood-frame building constructed in 1866 that is located approximately 500 feet west of the Stoughton Line at 26 Dean Street. The C.J. H. Bassett House (Map No. Ta.023, Ta.C) is an irregular-plan Gothic Revival style wood-frame building constructed in 1851 that is located approximately 950 feet west of the Stoughton Line at 20 Chestnut Street. The Abiezar Dean House (Map No. Ta.028, Ta.C) is a Federal style wood-frame building constructed circa 1835 that is located approximately 800 feet west of the Stoughton Line at 57 Summer Street. The Neck of Land Cemetery (Map No. Ta.029, Ta.C), which dates from 1687 to 1889, is located on Summer Street, approximately 100 feet west of the Stoughton Line. The cemetery is Taunton's oldest burial ground and contains the graves of many of Taunton's early prominent figures.

The following properties located between Raynham Junction (the Raynham town boundary) and Weir Junction (the junction of the Stoughton Line with the Attleboro Secondary) are eligible for National Register listing. The Taunton Center Area (Map No. Ta.B) is a large, irregularly shaped area located along the north and west sides of the Taunton River east and west of the Stoughton Line. It encompasses the Church Green National Register Historic District (outside the APE), the larger Church Green Local Historic District (within the APE), and the Ashland Street Area (within the APE, no map number). The High Street Area (Map No. Ta.D) is a residential neighborhood bounded by the Mill River to the north, the Stoughton Line to the east, the Attleboro Secondary to the south, and Winthrop Street to the west. It encompasses approximately 200 properties, the majority of which are Victorian period residences constructed between 1870 and 1910.

Whittenton Alternatives

The Whittenton Alternatives diverge from the Stoughton Alternatives at Raynham Junction in the Town of Raynham and extends 2.1 miles along the Whittenton Branch to Whittenton Junction, where it follows the Attleboro Secondary for 2.4 miles to Weir Junction, at which point the two alternatives are identical.

One property on the Whittenton Branch in Taunton is listed in the National Register. The Whittenton Mills Complex (Map No. Ta.G, Ta.C) is bounded by the Whittenton Branch right-of-way to the east, Whittenton Street to the south, and the Mill River to the west. The 20-acre industrial complex contains

ten major attached and freestanding brick and wood-frame industrial buildings dating from circa 1858 to 1895.

The following properties on the Whittenton Branch and Attleboro Secondary in Taunton are eligible for National Register listing. The Whittenton Mills Area (Map No. Ta.F) is centered on Whittenton Street, east of the Mill River, and located east and west of the Whittenton Branch. The area encompasses approximately 80 properties developed with worker housing and industrial buildings associated with the National Register listed Whittenton Mills Complex (Map No. Ta.G) discussed above. The Reed and Barton Mill Village (Map No. Ta.H) is a compact neighborhood of worker housing located along Meadow, Cottage, and Lawrence streets, to the southeast of Whittenton Branch near the proposed Whittenton Station site. It encompasses approximately 87 wood-frame residences constructed between the mid- to late nineteenth century. The Ancient Whittenton Area (Map No. Ta.I) is a linear area located on Whittenton and Warren streets that intersects the Whittenton Branch at the Warren Street railroad crossing and encompasses approximately 40 properties from the eighteenth and nineteenth century. Cohannet Mills No. 3 (Map No. Ta.089) located at 120 Ingell Street, is a rectangular, 426-foot by 107-foot, multi-bay, brick loft constructed in 1890 with a flat roof, segmental arch windows, a granite block foundation, and slow-burning interior construction. A boiler/engine house with a round brick chimney is attached to the west side of the building. Mill No. 3 is the only surviving building of three cotton spinning plants built in Taunton by Cohannet Mills. The mill was recently rehabilitated into 64 loft apartments. The Cohannet Mills No. 3 was individually listed in the National Register in 2006. The N.S. Mason House (Map No. Ta.181, Ta.C) is a two-and-one-half-story, wood-frame, front gabled, Italianate style house constructed circa 1865. The N.S. Mason House was listed in the National Register at the local level under Criteria A and C as part of the 1984 Taunton MRA, for its associations with the nineteenth-century development of Taunton and as an example of the Italianate style.

The St. Thomas Episcopal Church (Map No. Ta.208, Ta.C)is located at 111-115 High Street is a Gothic Revival style stone church with a basilica plan designed by Richard Upjohn and constructed between 1857 and 1859. The church retains coursed granite walls, limestone trim, buttresses, pointed arch windows, and round stained glass clerestory windows. The McKinstrey House (Map No. Ta.209, Ta.C) property is a two-story, five-bay by two-bay, Georgian style brick house constructed circa 1760.The house is currently used as the St. Thomas Episcopal Church rectory. The McKinstrey House was listed in the National Register as part of the 1984 Taunton MRA. The Henry G. Brownell House property (Map No. Ta.211, Ta.C) is a two-and-one-half story, three-bay-wide, Classical Revival style, wood-frame building constructed by local builder L.M. Witherell for Henry G. Brownell in 1893. The Henry G. Brownell House was listed in the National Register as part of the 1984 Taunton MRA. The Lord-Baylies-Bennett House (Map No. 245, Ta.C) is a one-and-one-half story, five-bay-wide, stone, Greek Revival style building constructed in 1831 with a portico. It retains its historic, low-pitched front gable roof with four interior brick chimneys, floor length rectangular window openings, stone lintels, and a central entrance with a transom and side lights. The portico has recessed panels on the cornice and is supported by 12 Doric columns. The Lord-Baylies-Bennett-House was listed in the National Register as part of the 1984 Taunton MRA. The Samuel Washburn House (Map No. 246, Ta.C) is located at 68 Winthrop Street is a two-story, three-bay by two-bay, Italianate style stone villa constructed circa 1860. The house retains its original near-flat hipped roof with deep overhanging eaves, stuccoed walls, and a cornice line belt course. The Samuel Washburn House was listed in the National Register as part of the 1984 Taunton MRA.

The Samuel Colby House (Map No. 254, Ta.C) is located at 74 Winthrop Street. The house is a two-story, three-bay by four-bay Italianate style, stone and stucco mansion constructed circa 1869. The building

retains its original flat roof with a rectangular belfry, overhanging bracketed eaves, rectangular window hoods; and a full-width, one-story Stick style porch. The Sarah A. Haskins House (Map No. Ta.259, Ta.C, Ta. D, Ta.V) is located at 18 Harrison Street. The house is a two-and-one-half story, three-bay-wide, Italianate style, wood-frame house was constructed circa 1852 with a front gable roof and stone foundation. The property is also located within the National Register eligible High Street area which incorporates the surveyed Harrison Street area (Map Nos. Ta.D and Ta.V). The Mount Pleasant Cemetery (Map No. Ta.262) is located at 19 Crocker Street. The cemetery encompasses an approximately 10-acre polygonal lot and contains more than 500 burials dating from 1710 through the mid-twentieth century. At least one-quarter of the plots in the cemetery are the burial sites of soldiers from the American Revolution, War of 1812, Civil War, Spanish-American War, World War I, World War II, and the Korean War. The J. C. Bartlett House (Map No. Ta.266, Ta.C) is located near the Winthrop Street grade crossing, at 12 Walnut Street. The house is a two-and-one-half-story, three-bay-wide, Second Empire style, wood-frame building constructed circa 1880. The J. C. Bartlett House was listed in the National Register at the local level under Criteria A and C as part of the 1984 Taunton MRA. The Albert Field Tack Works (Map No. Ta.293, Ta.C, Ta.Y, Ta.D) is located at 19 Spring Street. The Albert Field Tack Works consists of a two-and-one-half story, three-bay-wide, Italianate style brick office constructed in 1868, attached to a two-story brick loft with an exterior stair tower. The office has a central, pedimented bay with a round arched entrance set within an entrance porch. The tower has a steeply pitched hip roof with pedimented dormers.

The H. B. Lothrup Store (Map No. Ta.294, Ta.C, Ta.D) is located approximately 500 feet northeast of the Attleboro Secondary right-of-way on the Whittenton Alternatives, at 210 Weir Street. The house is a two-and-one-half story, three-bay-wide Italianate style, wood frame building constructed circa 1855 with a front gable roof and clapboard siding. The William Lawrence House (MHC No. TAU.334) is a two-and-one-half story, three-bay-wide, Second Empire style wood-frame mansion constructed circa 1870 and retains its original mansard roof with a rectangular belfry, shallow brackets and dentils, and arched dormers; clapboard siding, rectangular windows with protruding lintels, and granite foundation. A one-story full-width porch extends across the facade and defines a central entrance with a round-arched opening.

Dana Street Station

The Dana Street Station is proposed on a parcel between Dana Street and the Attleboro Secondary in Taunton. Dana Street replaces the Downtown Taunton Station that was previously under consideration at a different location. The Taunton State Hospital property (Map No. Ta.S), which is listed in the National Register, is located on the opposite side of Dana Street to the east. The Staples Coal Company (Map No. Ta.160) is located at 28 Dana Street south of the station APE.

Southern Triangle: New Bedford Main Line and Fall River Secondary

The Southern Triangle consists of the existing Fall River Secondary (active MassCoastal) railroad right-of-way, the existing New Bedford Main Line (active MassCoastal) railroad right-of-way, and five proposed stations: Freetown, Fall River Depot, Battleship Cove, King's Highway, and Whale's Tooth. The Southern Triangle also includes four proposed layover facility sites (one in Freetown, two in New Bedford and one in Fall River) and seven proposed traction power sites located along the existing Fall River Secondary (active MassCoastal) and the existing New Bedford Main Line (active MassCoastal) railroad rights-of-way in Berkley, Freetown, New Bedford, and Fall River. The Southern Triangle is common to both the Stoughton and Whittenton Alternatives.

The Southern Triangle results are discussed below from north to south by community and station, and are listed in the Historic Resources Intensive Survey, Appendix A. The surveyed properties discussed below are mapped on Figures 4.8-9 through 4.8-16. The following are descriptions of the areas/districts and individual properties identified during the survey as either listed in or determined eligible for listing in the National Register. No properties within the APE in the Southern Triangle have been designated as NHLs.

Berkley

Approximately 2.8 miles of the New Bedford Main Line and 0.7 mile of the Fall River Secondary rail rights-of-way, and one traction power site, are in Berkley as part of the Stoughton Alternatives. The junction of the New Bedford Main Line and Fall River Secondary with grade crossings at Myricks and Mill streets occurs within the Myricks Area (Map No. Be.C), a nineteenth-century railroad village. The New Bedford Main Line passes within 50 feet of 1 Macomber Street (Map No. Be.006) at the Padelford Street grade crossing, which is an Italianate style farmhouse constructed circa 1860. Both properties are eligible for National Register listing.

One traction power site (TP-06/TP-27) is proposed in Berkley as part of the Stoughton and Whittenton Alternatives.

- TP-06, Switching Station (SWS-2) as part of the Stoughton and Whittenton Alternatives, is located at the Myricks Street grade crossing of the New Bedford Main Line, within the National Register-eligible Myricks Area of mid-nineteenth- to early-twentieth-century residences (Map No. Be.C).

Lakeville

Approximately 3.5 miles of the New Bedford Main Line and 0.3 mile of the Fall River Secondary Line rail rights-of-way are in Lakeville as part of the Stoughton Alternatives. The Pierce and Haskins Cemetery (Map No. La.024), which is located 200 feet east of the Fall River Secondary right-of-way and is accessible from Adams Lane in Berkley, contains approximately 45 slate and granite headstones dating from 1785 to 1892. Bridge No. 18.37 Over the Assonet River (Map No. La.025), constructed in 1906, carries the Fall River Secondary over the Assonet River in Lakeville and is a rare surviving example of a two-span timber deck railroad bridge with timber abutments. The Assonet Cedar Swamp Area (Map No. La.C) in Lakeville is a cultural landscape encompassing the majority of the New Bedford Main Line that extends through Lakeville. It is comprised of approximately 2,670 acres of natural resources and cultural resources dating from the early eighteenth to early twentieth century. These three properties are eligible for National Register listing.

There are currently no proposed layover facilities or traction power sites in Lakeville. One bridge noted as having insufficient information in the March 2009 report, Bridge over Cedar Swamp River (Map No. La.022, Photo No. 237), was surveyed and found to not be National Register eligible.

Freetown

Approximately 3.5 miles of the New Bedford Main Line and 5 miles of the Fall River Secondary rail rights-of-way, two traction power sites, one layover facility and the proposed Freetown station, are in Freetown as part of the Stoughton Alternatives. The Richmond Road/Maple Tree Crossing Bridge (Map No. Ft.009), situated approximately 100 feet north of the Fall River Secondary Line near the grade

crossings at Richmond and Beechwood roads, is a dry-laid stone three-arch structure built in 1820–1824 and determined eligible for National Register listing. The National Register-listed Assonet Historic District (Map No. Ft.D) on the Fall River Secondary Line is a town center dating from 1720 to the mid twentieth century. It encompasses one property, a cattle pound, which extends into the APE. The Slab Bridge Road Area (Map No. Ft.C) is adjacent to or overlaps three grade crossings on the Fall River Secondary and is an intact neighborhood of late 18th to early twentieth century residential architecture.

Two traction power sites (TP-08 and TP-10) are proposed in Freetown as part of the Stoughton Alternatives.

- TP-08, Paralleling Station (PS-3), is located in a forested area on the New Bedford Main Line, near an existing electrical transmission line. There are no National Register listed or determined eligible properties in the APE.

- TP-10, Paralleling Station (PS-4), is located at the Copicut Road grade crossing of the Fall River Secondary rail right-of-way. No National Register listed or eligible historic properties have been identified in the APE.

New Bedford

Approximately 7.4 miles of the New Bedford Main Line rail right-of-way, three traction power sites, one layover facility and two stations—King's Highway and Whale's Tooth—are located in New Bedford as part of the Stoughton Alternatives. All the historic resources identified in New Bedford are along the New Bedford Main Line and south of Route 140. In the general vicinity of King's Highway Station between Route 140 and King's Highway Station/Tar Kiln Road, is the massive, reinforced concrete Belleville Warehouse Company Cotton Storage Building (Map No. NB.012) constructed in 1916. The warehouse is located on the east side of the New Bedford Main Line near the Nash Road railroad crossing and was determined eligible for National Register listing by the Keeper of the National Register. The following resources are eligible for listing in the National Register. The Manomet Mills Cotton Mill No. 4 (Map No. NB.011), located at 91 King Street on the east side of the New Bedford Main Line, is a brick loft constructed in 1920 for the purpose of spinning cord tire fabric. The Lambeth Rope Corporation Complex (Map No. NB.010) is a brick loft constructed between 1894 and 1918 to manufacture pulley ropes for textile mills, and is located at 627 to 637 Tarkiln Hill Road along the west side of the New Bedford Main Line, near the Tarkiln Hill Road railroad crossing.

Along the APE in between King's Highway Station/Tar Kiln Road and Route I-195, the following properties are National Register eligible. Connected early-twentieth-century brick buildings comprise the Pierce Brothers Textile Mill Complex (Map No. NB.026), manufacturers of fine cotton cloth products, that is located west of the New Bedford Main Line at 1125 County Street. The Gothic Revival-style, wood-frame Christ Presbyterian Church (Map No. NB.029), located approximately 250 feet west of the New Bedford Main Line at 1097 County Street, was constructed circa 1890. The Purchase Street Fire Station (Map No. NB.053) on the west side of the New Bedford Main Line at 2071 Purchase Street is a Renaissance Revival brick building constructed circa 1910.

The area between I-195 and Route 6 includes the following National Register listed properties. The Acushnet Heights Historic District (Map No. NB.C) is a nineteenth century residential neighborhood located west of the rail right-of-way near Acushnet Avenue. The Wamsutta Mills Historic District (Map No. NB.D), comprised of a cotton cloth mill established in 1847 and associated worker housing, is located east and west of the New Bedford Main Line where it crosses Acushnet Avenue. The Union

Street Railway Carbarn (Map No. NB.063) at 1959 Purchase Street in Weld Square, is a Classical Revival style, two-story, brick structure constructed in 1910. The Dawson Building (Map No. NB.065) at 1851 Purchase Street is a Classical Revival style, brick office building with cast-iron storefronts built in 1896. Both are also within the Acushnet Heights Historic District.

The following properties located between I-195 and Route 6 are eligible for National Register listing. The Classical Revival Style, brick New Bedford Textile School (Map No. NB.069) constructed between 1899 and 1911 sits one block west of the New Bedford Main Line at 1213 Purchase Street across John F. Kennedy Highway from the proposed Whale's Tooth Station. The Guardian Angel Parochial Schoolhouse (Map No. NB.064) constructed in 1896 and located 300 feet east of the New Bedford Main Line at 844 Acushnet Avenue is not eligible.

Three traction power sites and one layover facility are proposed in New Bedford as part of the Stoughton Alternatives.

TP-07, Substation (TPSS-2) is located south of Samuel Barnett Boulevard on the New Bedford Main Line, near the existing electrical transmission line. No National Register listed or eligible historic properties have been identified in the APE.

- TP-09, Paralleling Station (PS-6) is located on the New Bedford Main Line within 400 feet of four National Register listed resources: the Acushnet Heights Historic District (Map No. NB.C), Wamsutta Mills Historic District (Map No. NB.D), Union Street Railway Carbarn (Map No. NB.063), and the Dawson Building (Map No. NB.065).

- The Church Street Layover Facility is located on the west side of the New Bedford Main Line rail right-of-way near Church Street. No National Register listed or determined eligible historic properties have been identified in the APE.

- The Wamsutta Street Layover Facility is located on the east side of the New Bedford Main Line rail between Wamsutta Street and the proposed Whale's Tooth Station. The National Register Listed Wamsutta Mill Historic District (Map No. NB.D) and the National Register eligible Revere Copper Products mill (Map No. NB.080) are both located about 400 feet to the north.

Fall River

Approximately 6.5 miles of the Fall River Secondary line rail right-of-way, one traction power site and two stations, Fall River Depot and Battleship Cove, are located in Fall River as part of the Stoughton Alternatives. All of the historic resources in Fall River are situated along the Fall River Secondary rail corridor. The Southern Triangle encompasses seven historic districts and six individual properties included in the Fall River MRA (Map No. FR.C). The boundaries of the Fall River MRA are the city limits. The entire MRA consists of five National Register Historic Districts, 90 properties individually listed in the National Register, and four districts and one individual property determined eligible for National Register listing.

The following properties located between the Freetown town line and Route 79 are listed in the National Register. The William Collins House (Map No. FR.005, FR.C) is Federal style Cape Cod cottage constructed circa 1800 that is approximately 300 feet east of the Fall River Secondary at 3775 North Main Street. The North Christian Congregational Church (Map No. FR.006, FR.C) is a Gothic Revival style

wood-frame building constructed circa 1842 that is located 100 feet west of the Fall River Secondary at 3538 North Main Street. The Borden-Winslow House (Map No. FR.010, FR.C) is a wood-frame, Georgian style house constructed circa 1740 that is located approximately 400 feet east of the Fall River Secondary at 3063 North Main Street. The Squire William B. Canedy House (Map No. FR.012, FR.C) is a wood-frame, Federal style house constructed circa 1806 that is located approximately 100 feet east of the Fall River Secondary at 2634 North Main Street.

The following properties located between the Freetown town line and Route 79 are eligible for National Register listing. The North Main Street Area (Map No. FR.D) is an approximately 1-mile-long residential corridor roughly bounded by the Fall River Secondary to the west. It encompasses a neighborhood developed between the early nineteenth to the early twentieth century. The William J. Wiley Middle School (Map No. FR.013) is a Classical Revival style, steel and concrete building with red brick sheathing and brownstone trim constructed from 1911 to 1912. The school is located approximately 500 feet east of the Fall River Secondary at 2613 North Main Street within the potentially National Register eligible North Main Street Area.

The following properties located between Route 79 and President Avenue are listed in or eligible for listing in the National Register. The Border City Mills (Map No. FR.E, FR.C) are located on both sides of Weaver Street west of the Fall River Secondary and were constructed between 1872 and 1889 adjacent to a railroad spur connecting the Fall River Branch Railroad to a wharf on the Taunton River. The Sagamore Mill Nos. 1 and 3 Complex (Map No. FR.F, FR.C) consists of brick and granite textile mills built between 1888 and 1907, which are located on both sides of Ace Street on the west side of the Fall River Secondary. The Sagamore Mill No. 2 (Map No. FR.G, FR.C) is a five-story granite loft constructed in 1881, located at 1822 North Main Street across the Fall River Secondary right-of-way from the rest of the Sagamore Mills complex. The Foster Spinning Company (Map No. FR.H, FR.C) was constructed in 1916 at 119 Cove Street, west of the Fall River Secondary. The mill was the last new textile manufacturing facility established in Fall River. The Narragansett Mills complex (Map No. FR.J, FR.C) is comprised of nine brick buildings constructed between 1872 and 1895, located at the corner of North Main Street and Narragansett Street, approximately 400 feet east of the Fall River Secondary. The North Burial Ground (Map No. FR.K, FR.C) is a rectangular property bounded by the Fall River Secondary to the west, Brightman Street to the north, North Main Street to the east, and Cory Street to the south. It is the city’s oldest municipal cemetery, established circa 1810 and purchased by the City of Fall River in 1825. The Border City Mill No. 2 (Map No. FR.015, FR.C) is an Italianate style brick mill loft with an exterior stair tower constructed in 1873 for the manufacture of woolens that is located approximately 300 feet west of the Fall River Secondary at 1 Weaver Street. The Weaver Street Bridge (Map No. FR.016) over the Fall River Secondary is a single-span, built-up, riveted steel plate, deck girder structure constructed in 1910 that was previously determined National Register eligible by the SHPO. The bridge was rebuilt in 1960, but is notable for its highly decorative cast-iron railings and battered stone abutments. The Hathaway Brightman House (Map No. FR.026, FR.C) is a wood-frame, Gothic Revival style house constructed circa 1858 that is located approximately 400 feet east of the Fall River Secondary at 205 Crescent Street. The St. Joseph’s Roman Catholic Church Complex (Map No. FR.066, FR.C) is located approximately 800 feet east of the Fall River Secondary at 1355 North Main Street across from the North Burial Ground. The complex consists of a High Victorian Gothic style, brick church and Second Empire style, wood-frame rectory built circa 1880, and a school constructed in 1930.

The following properties located between Route 79 and President Avenue are eligible for National Register listing. The Wellington-Brownell Street Area (Map No. FR.I) is an approximately 0.5-mile-long neighborhood bounded by the Fall River Secondary to the east. The area encompasses a late-

nineteenth- and early-twentieth-century residential neighborhood formerly known as Mechanicsville and is eligible for National Register listing. The 311 Crescent Street House (Map No. FR.017) is a Second Empire style, multi-family, wood-frame residence constructed circa 1880 that is located approximately 400 feet east of the Fall River Secondary in the Border City Mills neighborhood. The St. Michael's Roman Catholic Church (Map No. FR.050) is a Neo-Gothic Revival style brick building constructed in 1896 that is located approximately 250 feet west of the Fall River Secondary at 199 Essex Street. The Cotton Warehouse (Map No. FR.67) located on the west side of the Fall River Secondary at 7 Oregon Street, was constructed of brick pier and spandrel walls with iron interior posts circa 1910.

The St. Matthew's Convent (Map No. FR.052) is a Colonial Revival style brick and concrete building constructed circa 1920 that is located approximately 300 feet west of the Fall River Secondary at 189 Wellington Street. The St. Matthew's School (Map No. FR.053) is a Colonial Revival style brick and concrete building constructed circa 1920 that is located on the west side of the Fall River Secondary at 221 Wellington Street. Based on the results of the intensive survey, the Corps, in consultation with the Massachusetts SHPO has determined these two properties to be ineligible.

The following properties located between President Avenue and Route I-195 are listed in the National Register. The Diners of Massachusetts Multiple Property Submission (Map No. FR.M) encompasses individual diners throughout Massachusetts, including Al Mac's Diner (Map No. FR.070, FR.M), which is located in the APE at 135 President's Avenue, approximately 300 feet west of the Fall River Secondary. Al Mac's is a stainless steel diner opened by Fall River's McDermott Lunch Company in 1954 and moved to its current location in the mid-1970s. The Lafayette-Durfee House (Map No. FR.082) is a wood-frame Georgian style building constructed circa 1747 that is located approximately 400 feet east of the Fall River Secondary. It was moved to its current location at 94 Cherry Street in 1874.

The following properties are located between President Avenue and Route I-195. The Pearce-Durfee Street Area (Map No. FR.L) is a large, 1-mile-long residential area bounded by the Fall River Secondary to the west. The area is defined by early nineteenth-century through the twentieth-century residential buildings that filled in a street grid originally laid out by 1850. The Pearce Durfee Street Area is eligible for listing on the National Register. The 800 Davol Street Inn (Map No. FR.073) is a wood-frame, Second Empire style building constructed circa 1870 that is located approximately 400 feet from the proposed Fall River Depot Station on the Fall River Secondary. The Davol Inn has been determined not eligible for listing on the National Register due to loss of the original historic fabric and replacement with modern materials. The 524 Durfee Street House (Map No. FR.081) is a wood-frame Italianate style house constructed circa 1870 that is located approximately 200 feet east of the Fall River Secondary. The Central Street Bridge over Quequechan River (Map No. FR.084) is located west of the Fall River Secondary, below the I-195 Braga Bridge. It is a single-span stone arch bridge constructed in 1903 in the course of a Fall River railroad grade elimination project and has been determined eligible for listing in the National Register.

The following property located between I-195 and the south terminus of the Fall River Secondary at Battleship Cove Station is listed in the National Register. The American Printing Company–Metacomet Mill (Map No. FR.N, FR.C) is a complex of masonry buildings constructed between 1847 and the early twentieth century along Anawan Street. The portion of the complex to the east of the Fall River Secondary contains the earliest buildings.

The following properties, located between I-195 and the south terminus of the Fall River Secondary at Battleship Cove Station, are eligible for National Register listing. The American Printing Company

Machine Shop (Map No. FR.088) is located approximately 400 feet west of the Fall River Secondary near Battleship Cove Station, at the corner of Anawan and Water streets. The machine shop is a brick mill loft constructed circa 1900 for the neighboring American Printing Company-Metacomet Mill, which is listed in the National Register. The Borden and Remington Company (Map No. FR.089) consists of a brick loft with connected brick structures constructed as a paint mixing factory circa 1890. The mill is located at 105 Anawan Street on the west side of the Fall River Secondary near Battleship Cove Station.

One traction power site is proposed in Fall River as part of the Stoughton Alternatives.

- TP-11, Paralleling Station (PS-05) as part of the Stoughton Alternatives is located in a dense urban area on the Fall River Secondary, near the proposed Fall River Depot Station, across from the National Register-eligible Pearce-Durfee Street Area (FR.L), a neighborhood constructed between 1870 and 1920.

Stations

Three of the proposed stations (Whale's Tooth, Fall River Depot, and Battleship Cove) have at least one historic resource within the APE that is an NHL or is listed in, eligible for the National Register. The proposed Whale's Tooth Station on the New Bedford Main Line is across John F. Kennedy Highway from the National Register-eligible New Bedford Textile School. The proposed Fall River Depot Station on the Fall River Secondary is adjacent to the Pearce-Durfee Street Area which is eligible. The proposed Battleship Cove Station at the terminus of the Fall River Secondary is adjacent to the National Register listed American Printing Company-Metacomet Mill complex, and the National Register- eligible American Printing Company Machine Shop, and Borden and Remington Company. The remaining two proposed stations (Freetown and King's Highway) do not have any historic resources within the APE that are designated as NHLs or listed in, or determined eligible for the National Register.

Two of the proposed stations (Easton Village and Taunton [Dean Street]) have at least one historic resource within the APE that is designated as an NHL, or listed in, previously determined eligible for, or recommended as eligible for the National Register. The proposed Easton Village Station on the Stoughton Line in Easton is located immediately adjacent to the Old Colony Railroad Station (Map No. Ea.003), which is part of a NHL district and is within the North Easton Historic District. The proposed station site abuts important contributing properties of this district that are associated with the Ames Shovel Works. The railroad also contributes to the setting of the district. The proposed Taunton (Dean Street) Station in Taunton is adjacent to the National Register-eligible Taunton Center Area.

The remaining three proposed stations (North Easton, Raynham Park, East Taunton [North]) do not have any historic resources within the APE that are designated as an NHL or listed in, or determined eligible for the National Register.

Two existing stations are historic resources: Canton Junction (Map No. Ca.001) at the junction of the Stoughton Line and Amtrak Northeast Corridor and Stoughton Station (Map No. St.025), which is also within the Downtown Stoughton Area. The third existing station, Canton Center, is not a historic resource but is adjacent to the Canton Center Area.

4.8.2.2 Archaeological Resources

The survey of areas of where archaeological sites may occur was undertaken in two phases. An initial reconnaissance survey was conducted which included the Stoughton Alternatives followed by

supplemental surveys which included the Whittenton Alternatives as well as additional survey information on the Stoughton Alternatives and identified areas of archaeological sensitivity. The second phase of survey was an intensive (locational) survey which was conducted in areas determined as archaeologically sensitive by the prior reconnaissance surveys. The intensive (locational) survey included areas identified as potentially sensitive by PAL and supplemented by additional information provided by the Corps.

This section presents the results of the intensive (locational) survey for the Stoughton and Whittenton Alternatives. Fifteen sensitive areas within the right-of-way and three station locations previously determined to be sensitive were subjected to intensive (locational) survey. The following discussion is organized by project element and sensitive area. The Intensive (Locational) Survey is provided as Appendix 4.8-B.

Stoughton Alternatives

The Stoughton Line portion of the Stoughton Alternatives consists of the Stoughton Line (active and inactive freight and commuter) railroad right-of-way, and five proposed stations (Stoughton, North Easton, Easton Village, Raynham Park, and Taunton Depot). There are also additional project elements that have been identified for this alternative including a new frontage road in Stoughton along the rail right-of-way, a grade separation (tunnel) crossing at Route 138 in Raynham, and a new third track (outside of the right-of-way) associated with the Taunton Depot Station. High sensitivity areas were assessed for the railroad right-of-way in Easton. These consist of an area north of Foundry Street that contains a documented nineteenth-century house lot and the area between Elm Street and the Stoughton town line that contains documented eighteenth- and nineteenth century domestic sites.

As identified during the 2001 survey, the sections of the Stoughton Line right-of-way that run through Hockomock and Pine swamps in Easton and Raynham are raised railroad embankments. The rail embankment traverses areas considered to have a high archaeological sensitivity for pre-contact resources.

Four of the proposed stations (Stoughton, North Easton, Easton Village, and Freetown) were identified as containing moderate and high sensitivity areas for potentially significant pre-contact sites and documented/recorded post-contact resources. The third track at the East Taunton Station was also assessed as having moderate sensitivity for pre-contact sites.

Intensive (Locational) Survey Results—Stoughton & Whittenton Alternatives, Not Including the Southern Triangle

The intensive (locational) archaeological survey resulted in the identification of 16 archaeological sites in Easton, Raynham, Taunton, Freetown, and Fall River, five of which are situated within the Lower Taunton River Basin archaeological district. These sites include two sites located in or near proposed stations, 10 pre-contact period sites within the proposed limit of work for the Stoughton Alternatives right-of-way, and four within the proposed limit of work for the Whittenton Alternatives right-of-way. Each of these 16 newly identified archaeological sites has been assessed for its research value/potential and eligibility for listing in the National Register. The survey also resulted in the identification of low density nineteenth and twentieth century sheet refuse/refuse scatters of cultural materials in two of the proposed station locations and all of the tested right-of-way segments. None of these sheet refuse/refuse scatters are associated with identified sites and none are considered to meet the criteria of eligibility for listing in the National Register.

North Easton Station—The intensive survey identified a low density of post-contact (likely late nineteenth-twentieth century) cultural materials within the sensitive portion of the North Easton Station project area. The materials are interpreted as sheet refuse and together with the stone wall suggest that premodern period agricultural activities took place within the project parcel. However, given the lack of cultural features other than the remnant stone wall, the sheet refuse is not considered to represent an archaeological site and is not eligible for listing in the National Register. No additional archaeological investigations are recommended within the North Easton Station project area.

Easton Village Station—The intensive survey identified railroad-related cultural deposits and fill strata within the sensitive portion of the Easton Village Station project area. The cultural deposits including structural remains and artifact assemblage are designated the Easton Village Railroad Station Site. Structural remains consist of: 1) the concrete piers in MT-04 (present parking lot) belonging to the documented early twentieth-century railroad water tower that was located south of the historic railroad station (extant Easton Historical Society building); and 2) a rectangular stone foundation, investigated in JTP-01 (wooded area), belonging to the documented late nineteenth/early twentieth century railroad shed located on Mechanic Street.

The cultural material assemblage consists exclusively of post-contact cultural materials (structural and domestic items). No structural remains or artifacts relating to documented pre-nineteenth century railroad industrial activities in this area were identified during the intensive survey. No pre-contact period artifacts or features were encountered in the trenches. Undisturbed, natural soils were encountered in only one trench, MT-03, and these intact soils were void of cultural materials. The fill episodes recorded in all of the excavated trenches represent three campaigns of railroad construction: the initial laying of the railroad track by the Dighton & Somerset Railroad Line between Stoughton and North Easton 1855, the Old Colony Railroad Line’s 1866 extension of the track to points south of North Easton, and the installation of an adjacent second track by the Old Colony Railroad in 1888. In each instance, large amounts of fill were required to raise the railroad roadbed to final grade. Photographs of the railroad from the late nineteenth century and early twentieth century illustrate the drastic changes the railroad brought to the landscape of the area. The identified railroad water tower pier remains possess poor physical integrity and the railroad shed foundation possesses fair integrity. The post-contact period artifact assemblage represents sheet refuse related to the railroad and modern period parking lot land uses, and is consistent with the documented mid-nineteenth to mid-twentieth century occupation of the railroad depot at this location. Given the limited complexity of the identified structural remains and artifacts and known period of occupation, they are considered to have a low research potential to provide significant new information relating to the historical record of the mid-nineteenth to mid-twentieth century Easton Village railroad depot and its role in the greater Old Colony Railroad transportation network. The Easton Village Railroad Station Site is therefore recommended as not eligible for listing in the National Register. No additional archaeological investigations within the Easton Village Station project area are recommended.

Freetown Station—The intensive survey identified a low density of post-contact nineteenth- to twentieth century) cultural materials and pre-contact lithic chipping debris within highly disturbed stratigraphic contexts in the Freetown Station project area. Due to the lack of associated features and the disturbed context of the post-contact cultural materials, they are interpreted as refuse scatter manipulated by late-twentieth century earthmoving activities. Given their geographic location within the Lower Taunton River Basin archaeological district and proximity to two known site areas, they are designated the Landowner’s Folly Site. However, the disturbed nature of their contexts and the lack of associated diagnostic artifacts, artifact concentrations, or features preclude their potential to yield

information important to the prehistory of the area. The Landowner's Folly Site is not eligible for listing in the National Register. No further archaeological investigations within the Freetown Station project area are recommended.

Elisha Harvey Gravesite—Preliminary research was conducted for the Captain Elisha Harvey Gravesite located adjacent to the South Coast Rail project railroad right-of-way in Easton, Massachusetts. The preliminary research consisted of collecting available information on the location and historical context of the gravesite. As part of the reseach effort, Mr. Frank Meninno of the Easton Historical Society was contacted for any information that is locally known about the gravesite. No parcel-level documentary (deed) research, contact with the Easton Historical Commission or Cemetery Commission, or field survey was conducted.

The Captain Elisha Harvey Gravesite is located within the YMCA property at 25 Elm Street on the west side of the railroad right-of-way, approximately one block north of the proposed Easton Village Station (Figure 4.8-17). The gravesite is indicated by a single granite marker inscribed as follows: "LOCATION OF CAPT. ELISHA HARVEY CEMETERY 1775." An aluminum post adorned with an American veteran's flag and small plaque that says "CAPT. ELISHA HARVEY 1757" is adjacent to the stone memorial. The monument is situated at the north end of the YMCA Wellness Center parking plot, and the grave's location is believed to have been near the northeast corner of the lot. The town of Easton placed and maintains the stone monument and marker at this location. The gravesite is located on town property, Assessor map U11-Lot 057, and is listed in the Town of Easton's Historic Preservation Plan as having been established in 1775. The Corps, in consultation with the Massachusetts SHPO, has determined that the Elisha Harvey Gravesite is eligible for listing in the National Register. The adjacent railroad right-of-way is at grade at this location on both sides of Elm Street.

There are no individual grave stones and the stone memorial information comes from town records. The gravesite is not included in the MHC inventory of historic and archaeological assets of the Commonwealth. It is physically located within the North Easton Historic District boundaries, although it is not mentioned in the 1972 National Register of Historic Places Inventory-Nomination Form. According to the Town of Easton Cemetery Database (last updated December 11, 2012), the gravesite contains nine burials associated with the Carr, Harvey, Packard, and Simmons families, including Elisha Harvey and his wife. The earliest recorded burial is Elizabeth Simmons in 1759, who was the daughter of Mrs. Eseck Carr and her first husband. The last dated burial is that of Captain Harvey in 1790. No other birth or death dates are known for the other recorded interments.

According to the Bristol County Massachusetts Cemeteries Database, the cemetery was abandoned in the mid-nineteenth century and later became part of the fields on a property owned by E.W. Gilbert "near where his hinge-factory stands."[3] At that time, Chaffin indicates that there was a graveyard containing about 15 graves in the field owned by E.W. Gilbert. According to Chaffin, the graves of Rev. Eseck Carr and his wife were reportedly removed to the Washington Street cemetery by their son when the Gilmore hinge-factory was built on the property. The remains of Capt. Elisha Harvey and his wife were left with others in the field "only a few feet from the northwest corner of the factory." Chaffin indicates that Elizabeth Simmons "died as early as the Revolutionary War," and hers was the first burial in this yard," offering a more recent burial date than that of 1759 recorded in the town's cemetery database.

[3] Chaffin, William L. 1886. History of the Town of Easton, Massachusetts.

No cemetery is indicated at this location on mid-eighteenth through mid-twentieth century town maps of Easton. The 1756 (Cobb) map suggests that the cemetery may have been established on property belonging to John Whitman Jr., or John and Samuel Randall at that time. An 1825 map of Easton depicts the property on the south side of Elm Street near this location as belonging to J. Packard, and containing one dwelling. The railroad was put through North Easton to Oliver Street by 1855 (Easton Branch Railroad), and extended to Weir Junction in Taunton in 1866. The 1855 (Walling) map of Easton shows the railroad, but does not indicate a cemetery or other structures adjacent to the west side of the tracks and Elm Street. The 1871 (Beers) map depicts the vacant property belonging to E.W. Gilmore west of the railroad and south of then-named Stoughton (Elm) Street. By the 1886 (Walker) map, the hinge factory building had been constructed adjacent to the railroad tracks south of Elm Street. The hinge factory was still present at the time of the 1895 (Everts and Richards) map. There is no indication of a cemetery on any of these later nineteenth-century maps, and the reported cemetery location at the northwest corner of the factory was depicted as vacant land. The 1942 (Hayward and Hayward) map of Easton also does not depict a cemetery at this location. According to Mr. Meninno of the Easton Historical Society, the Gilmore hinge factory was owned by the Gilmore family in the 1930s, and later absorbed into the Ames Shovel complex for use as a warehouse. The factory building burned in 1959 and was razed.

According to Mr. Meninno there are no known historical maps or boundaries of the cemetery, except for the description provided by William Chaffin in his 1886 history of the town. It is possible that additional documentary research (including parcel level deed work and interviews with members of the Easton Historical Commission and Easton Cemetery Commission) could provide more definitive historic property boundaries for the cemetery in relation to the railroad right-of-way. This information would be used to assist in the effects analysis for the gravesite and develop a written avoidance and protection plan.

Easton, North of Elm Street—The intensive survey identified a low density of post-contact (late nineteenth-twentieth century) cultural materials and one quartz chipping debris within disturbed railroad right-of-way/rail bed soil strata north of Elm Street in Easton. Due to the lack of associated features and the disturbed context, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The materials are not considered to represent an archaeological site and the Corps, in consultation with Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. No additional archaeological investigations are recommended within the Easton, North of Elm Street right-of-way segment.

The two fieldstone foundations of the previously identified Site EST-HA-25 are situated outside of the right-of-way and beyond the limit of project-related disturbances on private property. Postcontact artifacts recovered from the portion of the project area closest to the site cannot be conclusively associated with it due to the residential nature of the surrounding area and railroad-related soil manipulations. However, since the foundations have not been investigated for their significance and National Register eligibility, and given their close proximity (2 meters [6.5 feet]) to the project right-of-way, they would be protected prior to and during project construction activities through the installation of high visibility fencing to avoid inadvertent disturbances.

Easton, North of Depot Street—The intensive survey identified a low density of post-contact (late nineteenth-twentieth century) cultural materials within disturbed railroad right-of-way/rail bed soil strata north of Depot Street in Easton. Due to the lack of associated features and the disturbed context, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The right-of-way extends through residential areas and is

visited by local residents. Much of the bottle glass recorded in test pits is likely indicative of the unauthorized recreational use of the area rather than evidence of historic occupation. The materials are not considered to represent an archaeological site and the Corps, in consultation with Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. No additional archaeological investigations are recommended within the Easton, North of Depot Street right-of-way segment.

Easton, North of Prospect Street—The intensive survey identified a low density of post-contact (nineteenth-twentieth century) cultural materials within primarily disturbed railroad right-of-way/rail bed soil strata north of Prospect Street in Easton. Due to the lack of associated features and the disturbed context, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The right-of-way is visited by local residents, and most of the bottle glass recovered is likely indicative of the recreational use of the area rather than evidence of historic occupation. The materials are not considered to represent an archaeological site and the Corps, in consultation with Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. No additional archaeological investigations are recommended within the Easton, North of the Prospect Street right-of-way segment.

Easton, North of Foundry Street—The intensive survey identified a low density of post-contact (late nineteenth-twentieth century) cultural materials within disturbed railroad right-of-way/rail bed soil strata north of Foundry Street in Easton. No structural remains or artifacts associated with the nearby nineteenth-century Pool family homestead and workshop were identified within the right-of-way. Due to the lack of associated features and the disturbed context, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The materials are not considered to represent an archaeological site and the Corps, in consultation with Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. No additional archaeological investigations are recommended within the Easton, North of Foundry Street right-of-way segment.

Stoughton Alternatives Right-of-way

The intensive survey identified a low density of post-contact (nineteenth-twentieth century) cultural materials within primarily disturbed railroad right-of-way/rail bed soil strata in the Hockomock Swamp raised railroad embankment. Due to the lack of associated features and the disturbed context of these materials, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The post contact materials are not considered to represent an archaeological site and the Corps, in consultation with Massachusetts SHPO, has determined that they are not eligible for listing in the National Register.

Two pre-contact Native American archaeological sites were identified during the intensive survey, designated the Skunk Trapper Site and the Saws Wood Site. While the intensive survey testing did not identify diagnostic artifacts or cultural features at either site area, the presence of chipping debris and variety of lithic material types (rhyolite, quartz, and argillite) suggests that additional classes of data including diagnostic tools and subsistence-related features and activity areas may be present. The Skunk Trapper Site and Saws Wood Sites therefore have the potential to yield information that is important in the region's precontact period archaeological record, and the Corps, in consultation with the Massachusetts SHPO has determined that they both meet Criterion D of eligibility for listing in the National Register.

The intensive survey identified a low density of post-contact (nineteenth-twentieth century) cultural materials within primarily disturbed railroad right-of-way/rail bed soil strata in the Pine Swamp raised railroad embankment. Due to the lack of associated features and the disturbed context of these materials, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The post-contact materials are not considered to represent an archaeological site and are not eligible for listing in the National Register.

Three additional pre-contact Native American archaeological sites were identified during the intensive survey of the Stoughton right-of-way, designated the King Philip Street Site, the Chickering Road Site, and the East Britannia Street Site. At all three locations, the cultural deposits could extend beyond the limits of the right-of-way. While the intensive survey testing did not identify diagnostic artifacts or cultural features in the site areas, the presence of chipping debris, stone tools, and variety of lithic material types (quartz, argillite) suggests that additional classes of data including diagnostic tools and subsistence-related features and activity areas may be present. The King Philip Street Site, Chickering Road Site, and East Britannia Street Site therefore have the potential to yield information that is important in the region's pre-contact period archaeological record, and the Corps, in consultation with the Massachusetts SHPO and the Wampanoag Tribe of Gay Head (Aquinnah) Tribal Preservation Officer has determined all three sites meet Criterion D of eligibility for listing in the National Register.

Taunton and Mill River Bridge Crossings—The intensive survey identified a low density of post-contact (late eighteenth-nineteenth-twentieth century) cultural materials within primarily disturbed railroad right-of-way/rail bed soil strata in the Taunton and Mill River Bridge crossings portion of the Stoughton Alternatives right-of-way. Due to the lack of associated features and the disturbed context of these materials, they are interpreted as refuse scatter introduced and/or redeposited by nineteenth- and twentieth-century railroad construction and maintenance activities. The materials are not considered to represent an archaeological site and the Corps, in consultation with Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. No additional archaeological investigations are recommended within the Taunton and Mill River Bridge crossings right-of-way segment.

Whittenton Alternatives

The Whittenton Alternatives consist of the Stoughton Line (active and inactive freight and commuter) railroad right-of-way as well as the Whittenton Branch right-of-way and portions of the Attleboro Secondary railroad right-of-way. It has the same stations as the Stoughton Alternatives, except for the Taunton (Dean Street) Station and includes one station exclusively associated with the Whittenton Alternatives: the Dana Street Station. The total right-of-way of the Whittenton Alternatives are the same as that of the Stoughton Alternatives except for the Whittenton Branch (inactive) railroad right-of-way, located west of Taunton and a short section of the Attleboro Secondary (active freight) railroad right-of-way. The Whittenton Alternatives do not include the portion of the Stoughton right-of-way extending through Pine Swamp, east of Taunton. The supplemental cultural resource survey conducted of the Whittenton Alternatives and included in the Whittenton Technical Report identified two areas considered archaeologically sensitive for pre-contact sites.

Whittenton Branch 1—The intensive survey identified a low density of post-contact (nineteenth-twentieth century) cultural materials within primarily disturbed railroad right-of-way/rail bed soil strata in the Whittenton Branch 1 sensitivity area of the Whittenton Alternatives right-of-way. Due to the lack of associated features and the disturbed context of the majority of these materials, they

are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The post-contact materials are not considered to represent an archaeological site and the Corps, in consultation with the Massachusetts SHPO, has determined that they are not eligible for listing in the National Register.

Three pre-contact Native American archaeological sites were identified during the intensive survey, designated the Mel's Diner Site, the Pine Crest Site, and the ATV Trail Site. The testing at the Mel's Diner Site resulted in the recovery of five quartz chipping debris. The Pine Crest Site is situated to the south of the Mel's Diner Site. While the intensive survey testing did not identify diagnostic artifacts or cultural features in the site areas, the presence of chipping debris and a hammerstone suggests that additional classes of data including diagnostic tools and subsistence-related features and activity areas may be present. The Mel's Diner Site, Pine Crest Site, and ATV Trail Site within the Whittenton Branch right-of-way therefore have the potential to yield information that is important in the region's pre-contact period archaeological record, and the Corps, in consultation with the Massachusetts SHPO and Aquinnah Tribal Historic Preservation Officer (THPO), has determined that all three sites meet Criterion D of eligibility for listing in the National Register.

Whittenton Branch 2—The intensive survey identified a low density of post-contact (nineteenth-twentieth century) cultural materials within primarily disturbed railroad right-of-way/rail bed soil strata in the Whittenton Branch 2 sensitivity area of the Whittenton Alternatives right-of-way. Due to the lack of associated features and the disturbed context of the majority of these materials, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The post-contact materials are not considered to represent an archaeological site and Corps, in consultation with the Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. One pre-contact Native American archaeological site was identified during the intensive survey, designated the Cedar Swamp Site. The Cedar Swamp Site within the Whittenton Branch right-of-way therefore has the potential to yield information that is important in the region's pre-contact period archaeological record, and the Corps, in consultation with the Massachusetts SHPO and Aquinnah THPO, has determined that the three sites meet Criterion D and are eligible for listing in the National Register.

Attleboro Secondary—No archaeologically sensitive areas were identified within the rail right-of way that includes the Attleboro Secondary from Whittenton Junction to Weir Junction. Proposed impacts for track improvements within the rail right-of-way are not anticipated to extend outside previously disturbed soil contexts, with the possible exception of the overhead catenary structure support footings that would be needed within the Attleboro Secondary right-of-way for the electrification option.

Stoughton and Whittenton Alternatives—Southern Triangle

The Southern Triangle consists of the existing Fall River Secondary railroad right-of-way, the existing New Bedford Main Line railroad right-of-way, and five proposed stations: Freetown, Fall River Depot, Battleship Cove, King's Highway, and Whale's Tooth. No archaeologically sensitive areas were identified within the rail rights-of way; however, several sensitive areas were found immediately adjacent to them. One of these areas is located along the Fall River Secondary. The other two areas are located along the New Bedford Main Line. They consist of pre-railroad origin cemeteries where the rail right-of-way appears to have cut through (in the case of Freetown) and/or cut along the historic cemetery properties. Both areas have the potential for unmarked burials in the right-of-way embankments.

The Freetown Station project area is identified as containing moderate and high sensitivity areas for potentially significant pre-contact sites and documented/recorded post-contact resources. The Freetown Station is located within the Lower Taunton River Basin Archaeological District, an area designated by the MHC as being highly sensitive for significant pre-contact and contact period Native American sites. A 1.6-mile section of the Fall River railroad right-of-way also lies within this archaeological district.

The remaining stations (Fall River Depot and Battleship Cove) along the Southern Triangle were assessed as having low sensitivity. This assessment is based primarily on the presence of historic and modern period disturbances that have severely compromised the below-ground soil integrity and potential for any meaningful archaeological contexts to be present.

Third Track at Taunton Depot Station—The intensive survey identified a low density of post-contact (nineteenth-twentieth century) cultural materials within the Third Track at Taunton Depot Station right-of-way segment. The materials identified in the disturbed railroad right-of-way/rail bed soil strata are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. Given the lack of cultural features and the disturbed stratigraphic context, these materials are not considered to represent an archaeological site and the Corps, in consultation with the Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. No additional archaeological investigations are recommended within the Third Track at East Taunton Station right-of-way segment.

Fall River Secondary—Lower Taunton River Basin Archaeological District—The intensive survey identified a low density of post-contact (nineteenth-twentieth century) cultural materials within primarily disturbed railroad right-of-way/rail bed soil strata in the Lower Taunton River Basin Archaeological District section of the Fall River Secondary right-of-way. Due to the lack of associated features and the disturbed context of these materials, they are interpreted as refuse scatter manipulated by nineteenth and twentieth-century railroad construction and maintenance activities. The post-contact materials are not considered to represent an archaeological site and the Corps, in consultation with the Massachusetts SHPO, has determined that they are not eligible for listing in the National Register. Five pre-contact Native American archaeological sites were identified within the Lower Taunton River Basin Archaeological District during the intensive survey. These sites are designated the Quartz Vein Site, the Circling Hawk Site, the Cold Toad Site, the Overlook Site North, and the Overlook Site South.

The Quartz Vein Site is located in close proximity to a previously identified site, which yielded quartz and rhyolite chipping debris and two quartz bifaces and was interpreted as a small temporary camp site focusing on lithic manufacture and/or maintenance. Since the Quartz Vein Site cannot be conclusively associated to the nearby site, the cultural deposits are being treated as a separate site area, though the boundaries are not completely defined. The site is adjacent to a large granitic rock outcrop with a visible quartz vein, just outside the right-of-way to the west.

The Quartz Vein Site is representative of Native American land use during the pre-contact, contact, and/or early historic periods. Given its geographic location within the Lower Taunton River Basin archaeological district and close proximity to several other sites, the Quartz Vein Site within the Fall River Secondary right-of-way has the potential to yield information that is important to the region's pre-contact period archaeological record and the Corps, in consultation with the Massachusetts SHPO, and the Aquinnah THPO, has determined that the site is eligible for listing in the National Register.

The Circling Hawk Site is located within the right-of-way and is within the boundaries for a previously recorded site. The MHC site file indicates that it is a large camp site identified by surface collections containing both Archaic and Woodland period cultural material but a description/list of these items is not included with the site form. The presence of a Narrow Stemmed projectile point indicates a Late Archaic through Early Woodland period (5000–1600 Before Present [B.P.]) occupation. While the intensive survey testing did not identify any cultural features, the variety of lithic material types and a finished tool indicates the presence of multiple lithic workshops on the site. The Circling Hawk Site is representative of Native American land use during the pre-contact, contact, and/or early historic periods. Given its geographic location within the Lower Taunton River Basin archaeological district and within the boundaries of a previously recorded site, the Circling Hawk Site within the Fall River Secondary right-of-way has the potential to yield information that is important to the region's pre-contact period archaeological record and the Corps, in consultation with the Massachusetts SHPO, and the Aquinnah SHPO, has determined that the site is eligible for listing in the National Register.

The Cold Toad Site is within the boundaries for a previously recorded site and is in close proximity to a second previously recorded site. The first site is a multicomponent site dating from the Late Archaic–Late Woodland periods (5000–450 B.P). The second site is a small lithic tool manufacture/maintenance site that contained chipping debris, shell, and bone but no finished tools or diagnostic artifacts. Subsurface testing at the Cold Toad Site recovered pre-contact cultural material including chipping debris (rhyolite, quartz), a rhyolite biface, fire-cracked rock, and an identified feature. The feature contained rhyolite chipping debris and fire-cracked rock and possibly represents a hearth or shallow cooking pit based on the visible profile. The cultural deposits could extend beyond the limits of the right-of-way. Since the Cold Toad Site cannot be conclusively associated with previously recorded sites in the area, the cultural deposits are being treated as a separate site area. The Cold Toad Site is representative of Native American land use during the pre-contact, contact, and/or early historic periods. Given its geographic location within the Lower Taunton River Basin archaeological district and its relationship to the encompassing and nearby sites, the Cold Toad Site has the potential to yield information that is important to the region's pre-contact period archaeological record and the Corps, in consultation with the Massachusetts SHPO and the Aquinnah THPO, has determined that the site is eligible for listing in the National Register.

The Overlook Site North is also within the boundaries for a previously recorded site mentioned above and is in close proximity to two others. One of these sites is identified as a lithic workshop and shell/trash midden dating to the Late Archaic Period (5000–3000 B.P.). Materials recovered from this site include a high density of chipping debris, lithic cores, stone tool bifaces, a scraper, and a hammerstone. Two diagnostic projectile points, an Atlantic-like broad dating to the Late or Transitional Archaic period (5000–2500 B.P.) and a Small Stemmed projectile point that dates from the Late Archaic through Woodland periods (5000–450 B.P.). Since the Overlook Site North cannot be conclusively associated to any known sites, the cultural deposits are being treated as a separate site area. The presence of aboriginal pottery indicates a Woodland period (3000–450 B.P.) occupation; however, the piece recovered was too small to refine the date further.

It is possible the shell deposit noted at the Overlook Site North is related to post-contact agricultural practice; however additional testing and/or dating of the shell would be required to make a determination. The Overlook Site North is representative of Native American land use during the pre-contact, contact, and/or early historic periods. Given its geographic location within the Lower Taunton River Basin archaeological district and its relationship to the encompassing and nearby sites the Overlook Site North has the potential to yield information that is important to the region's pre-contact

period archaeological record and the Corps, in consultation with the Massachusetts SHPO and the Aquinnah THPO, has determined that the site is eligible for listing in the National Register.

The Overlook Site South is situated within the boundaries for a previously recorded site and is in close proximity to a second. Since the Overlook Site South cannot be conclusively associated to the previously known sites, the cultural deposits are being treated as a separate site area. The Overlook Site South is representative of Native American land use during the pre-contact, contact, and/or early historic periods. Given its geographic location within the Lower Taunton River Basin archaeological district and its relationship to the encompassing and nearby sites, the Overlook Site South has the potential to yield information that is important to the region's pre-contact period archaeological record and the Corps, in consultation with the Massachusetts SHPO and the Aquinnah THPO, has determined that the site is eligible for listing in the National Register.

New Bedford Main Line—Braley Cemetery—The intensive survey included deed and documentary research for the historic Braley Cemetery located in Freetown between East Chipaway Road and the Freetown-Dartmouth/New Bedford town line (Figure 4.8-12). The research was conducted at the request of the Corps to fully demarcate both the historical and modern boundaries of the cemetery on each side of the contemporary rail right-of-way. The research involved close coordination with the Freetown Cemetery Commission to ascertain the modern boundaries of the cemetery, which consists of three individual lots, two under presumed Town jurisdiction and one privately owned. The historical boundaries in relation to the railroad right-of-way and surrounding parcels are less clearly defined and more research into town meeting and church records may provide additional information. Land evidence and town/cemetery commission records indicate that the oldest part of the Braley Cemetery was in existence prior to the construction of the railroad line in 1839-1840. A number of graves are present within 15 feet of the cut stone retaining wall along the right-of-way embankment, and it is considered possible that graves pre-dating the construction of the railroad were present in the strip of land included in the present-day New Bedford Main Line right-of-way. Presumably any such graves would have been moved by the families at the time of the transfer of property to the railroad company (1840, 1879), particularly since the right-of-way was constructed in a cut embankment. The Braley Cemetery (MHC #FRE.823) is not eligible for listing in the National Register, though steps would be taken to avoid disturbance to any marked and/or unmarked interments during construction.

Layover Facilities

The proposed Wamsutta layover facility in New Bedford was assessed as having high archaeological sensitivity for pre-contact/contact Native American habitation and resource procurement/processing sites and post-contact euro-american domestic, commercial/wharves, and railroad-related structures and cultural deposits below the clean fill-geotextile composition cap. The proposed Weaver's Cove West layover facility in Fall River was previously surveyed for the proposed Weaver's Cove LNG terminal and was assessed as archaeologically non-sensitive.

Additional Work Areas

Areas that possess a moderate sensitivity to project-related disturbances, such as from overhead catenary structures would extend beneath railroad fill and thus, potentially require intensive survey.

The survey would consist of additional background research, including review of soil borings data if and when available, along with subsurface testing in areas of current (or refined) moderate and high

sensitivity. The amount and type of subsurface testing would need to be determined for each archaeologically sensitive area where project impacts are planned.

Avoidance zones would be delineated on project maps for the sensitive off right-of-way work areas identified in Lakeville, Freetown and Easton where there are two pre-railroad cemeteries, and an historical archaeological site of unknown age lying just outside the right-of-way. Protection measures should be implemented during and after construction along the right-of-way property lines in these areas. These measures could consist of high visibility barriers (i.e., orange construction fencing) and staked hay bales put in place prior to construction work to ensure that soils containing important archaeological deposits and marked/unmarked graves are not inadvertently disturbed during clearing and excavation activities.

Recommendations for Surveyed Areas

No further archaeological investigations are recommended for the Stoughton and Whittenton Alternatives rail right-of-ways where project improvements are not anticipated to extend outside previously disturbed soil contexts resulting from construction, maintenance/improvements, and ongoing rail operations. These disturbed right-of-way areas include fill materials, ballast, ties, and rails.

Additional reconnaissance survey for overhead catenary structure support footings within railroad right-of-ways may also be needed to determine the potential for archaeologically sensitive strata below rail bed fill. This additional survey would consist primarily of a review of detailed soil profiles for the project right-of-ways based on soil borings when available. Intensive survey would be conducted in identified sensitive areas where support footings would extend below the rail bed disturbance/fill deposits.

Outstanding Work Areas

There are a number of potential work areas for the Stoughton and Whittenton Alternatives within the South Coast Rail APE that have not yet been subjected to an Intensive (locational) survey. The completion of these surveys would be undertaken when the design aspects of these project elements have been identified at a level sufficient for survey. The elements are addressed in the PA for the project; for the draft PA, see Appendix 4.8-A.

For both the Whittenton and Stoughton Diesel Alternatives this includes the following project elements:

- Portions of the proposed Stoughton Station proposed Dana Street Station
- Grade crossing/road intersection modifications, particularly where existing driveways would be relocated and other ground disturbances are planned outside of existing rail and road rights-of-way
- Temporary and permanent construction easements and property takings off right-of-way along the railroad corridors including utilities work, staging, and construction access roads

For the Whittenton and Stoughton Electric Alternatives, all of the above listed project elements in addition to:

- Electrification facilities (substations, switching stations, paralleling stations and associated access roads) along the Stoughton Line, Whittenton Branch, Attleboro Secondary, Fall River Secondary, and New Bedford Main Line railroad right-of-ways

In summary, a number of known post-contact sites have been identified as described above, and the Corps, in consultation with the Massachusetts SHPO has determined pursuant to 36 CFR 800 et seq. and Appendix C to 33 CFR 325 which of the sites are eligible for inclusion in the National Register. Descriptions of these areas are provided above. The Corps has also identified pre-contact Native American sites and determined that they are likewise eligible for the National Register. The Corps has obtained the concurrence from the Massachusetts SHPO on the eligibility of identified sites for listing in the National Register.

4.8.3 Analysis of Impacts

The following section identifies the potential direct and indirect, as well as the permanent and temporary construction impacts to historic and archaeological resources from implementation of the South Coast Rail project for each element of the alternatives as defined in Chapter 3, *Alternatives*. The potential impacts along the railroad and highway alignments, including traction power facilities for rail electrification, are described in Sections 4.8.3.1 through 4.8.3.5; the potential impacts at the station locations are described in Section 4.8.3.6; and the potential impacts at layover facilities are described in Section 4.8.3.7. Figure 1.4-1 shows the alternative alignments and existing and proposed stations. For each alternative and segment or element of alternative (e.g. station), direct, impacts on historic resources are discussed first, followed by the discussion of archaeological impacts for that alternative segment, or element. Impact analyses are based on the intensive level cultural resources identification completed to date. Specific project elements where additional reconnaissance survey work is anticipated are discussed below. Any additional Intensive-level surveys will be completed prior when more detailed design information is available, and are described in the PA (Appendix 4.8-A).

The effects analysis assessed the potential effects to historic properties based on two types of impacts: 1) direct, or physical impacts to a property; and 2) indirect noise impacts and indirect visual impacts caused by changes in the setting of a historic property or district or a cumulative increase in noise that will result from the project. Indirect noise impacts were classified as Train Noise generated by the operation of trains travelling on rails, Horn Noise generated by warning horn sounding, typically at grade crossings and ranked as Moderate, the potential to cause noticeably increased noise levels and Severe, the potential to cause a significant increase in noise. In many cases, these noise levels were classified as Moderate to Severe. Indirect visual impacts were classified as Minimal, Moderate, or Severe. Additional information regarding the effects analysis can be found in Appendix 4.8-B.

Figures 4.8-2 through 4.8-16 depict the locations of historic resources by alternatives. Appendix 4.8-B presents lists of historic resources and project impacts by alternatives with summaries of alternatives, stations, and layovers.

4.8.3.1 Stoughton Electric Alternative

The Stoughton Electric Alternative alignment would provide commuter rail service from Fall River and New Bedford to South Station through Stoughton, connecting to the existing Stoughton Line and an out-of-service railroad bed. This alternative would use the Northeast Corridor from South Station to Canton Junction. From Canton Junction, the existing Stoughton line would be used to the Stoughton Station.

From there, commuter rail service would be extended, reconstructing a railroad on the out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton.

This alignment joins the New Bedford Main Line at Weir Junction, the northern end of the Southern Triangle. Existing commuter rail track would be upgraded to a double track, for the 7.26 miles from Canton Junction to just south of the proposed North Easton station. The remainder of the line south to Weir Junction would be single track, with a 1.19-mile-long double track section in Raynham, a 0.56-mile-long double track section in Taunton, and a 0.44-mile double track section approaching Weir Junction. Infrastructure improvements also include constructing, reconstructing, or widening 43 bridges. New catenary supports, wires, and a new traction power system would be constructed along the length of the line. In addition, three traction power facilities also would be constructed. These are:

- TP-05, Paralleling Station (PS-2) in Taunton
- TP-04, 115 KV Substation (TPSS-1) in Easton
- TP-02, Switching Station (SWS-1) in Canton

One existing train stations would be reconstructed (Canton Center) along the active Stoughton line segment and five new train stations would be constructed (Stoughton, North Easton, Easton Village, Raynham Park, and Downtown Taunton) in the inactive segment. No new layover facilities would be constructed.

A frontage road would be constructed in Stoughton to eliminate grade crossings, and a new grade separation would be constructed at Route 138 in Raynham. A 1.6-mile-long trestle section would be constructed in Raynham and Easton through the Hockomock Swamp.

A cultural resources intensive survey was conducted for the Stoughton Electric Alternative elements and impacts to identified resources are presented below. This section focuses on the existing and extended Stoughton line segment from Canton Junction to Weir Junction.

Historic Resources

The impacts to historic resources along the Stoughton Line segment of the Stoughton Electric Alternative may be permanent or temporary, direct or indirect. A total of 30 historic properties located within the Stoughton Line APE may be affected by the project. Figures 4.8-2 to 4.8-6 show the location of historic resources along the Stoughton Line. Appendix 4.8-B presents the potential impacts to historic resources for the Stoughton Electric Alternative.

Direct Impacts

Direct impacts for the Stoughton Line electric option would be similar to the other project electric alternatives.

The 2,000 feet of the Stoughton Line: Dighton and Somerset/Old Colony Railroad, Fall River Line Railroad Corridor (Map No. Ea.A; Figure 4.8-4) right-of-way that extends through the existing North Easton National Register Historic District will be affected by rebuilding of the rail bed, track, and equipment. This rail segment has been determined as contributing to setting of the district. The proposed changes will alter the physical appearance of the rail right-of-way, including rebuilding the Main Street Bridge.

The alterations would have an adverse effect on the physical properties of both the Stoughton Line segment and the North Easton National Register Historic District.

There will be no direct impacts to historic resources from work at grade crossings or at the three traction power facilities (listed above).

Indirect Impacts

Indirect impacts from the Stoughton Line electric option would be similar to the other electric alternatives. Clearing 60 to 100 feet of vegetation along the right-of-way and grading along the abandoned section of the Stoughton Line south of Stoughton Station would increase right-of-way visibility and affect the setting of historic resources.

The changes to infrastructure and the introduction of new structures along the Stoughton Line would have indirect visual effects on the H.H. Richardson Historic District (Map No. Ea.D, Figure 4.8-4) and the North Easton Historic District (Map No. Ea.B, Figure 4.8-4).

The H.H. Richardson Historic District of North Easton is a discontiguous NHL district consisting of five properties. These properties are the Oliver Ames Free Library (1877), Oakes Ames Memorial Hall (1879), Ames Gate Lodge (1880) and Ames Gardener's Cottage (1884) at Langwater, and the Old Colony Railroad Station (1881), currently owned by the North Easton Historical Society. Of this grouping, the Oliver Ames Free Library and the Oakes Ames Memorial Hall are approximately 400 feet west of the proposed Easton Village Station and the Old Colony Railroad Station is located immediately north of the proposed station abutting the rail right-of-way. The other two properties are well outside of the project APE (see PAL 2009: Volume 5, pg. 14). The proposed changes to the Stoughton Line and the introduction of a new station will affect the visual setting of the three historic properties closest to the project through the introduction of new elements. Adverse effects to National Historic Landmarks require special considerations to avoid, minimize, or mitigate adverse effects and options for mitigating visual impact through color or landscaping are recommended.

The North Easton Historic District (Map No. Ea.B) encompasses the Stoughton Line between Main and Elm streets and the proposed Easton Village Station site. The district includes the Ames Company Shovel Shop complex located adjacent to the proposed Easton Village Station. The Stoughton Line right-of-way (Map No. Ea.A) track structure—including bridges, cuts and fills, retaining walls, and signal infrastructure—is recommended as important to the setting of this district. The changes to the Stoughton Line will alter the appearance of the Stoughton Line: Dighton and Somerset/Old Colony Line segment as noted above. Construction of a new station platform, access and drop off area will occur adjacent to the North Easton Station and Ames Shovel Shop. The design of these changes will introduce new modern rail elements that will have a visual adverse effect.

The introduction of additional rail service will result in increased noise during operations from train noise and horn blowing at grade crossings that will cause moderate to severe noise, or severe at residential, contemplative, and quiet setting historic resources. The sound intrusions may be mitigated through the use of sound insulation or barrier mitigation. In addition to the potential for noise impacts, one historic resource would be affected by the introduction of modern power structures (from a traction power station) that will alter its historic setting. The grade crossings and traction power station facility and the historic properties and areas that would be affected are listed below.

- Washington Street grade crossing: Washington Street Commercial and Institutional District, Canton (Map No. Ca.C; Figure 4.8-2)
- School Street, Porter Street, and Wyman Street grade crossings: Downtown Stoughton Area, Stoughton (Map No. St.B; Figure 4.8-3)
- Oliver Street and Elm Street grade crossings: North Easton Historic District, Easton (Map No. Ea.B, Figure 4.8-4)
- Elm Street grade crossing: Holmes-Linden Street Area, Easton (Map No. Ea.C, Figure 4.8-4);
- Reynolds Street grade crossing: Center Street Area, Easton (Map No. Ea.E, Figure 4.8-4);
- Short Street and Depot Street grade crossings: Easton Center Area, Easton (Map No. Ea.F; Figure 4.8-4);
- Foundry Street grade crossing: Hayward-Pool Area, Easton (Map No. Ea.G, Figure 4.8-5);
- Carver Street grade crossing: Carver Street, Broadway, Raynham (Route 138) (Map No. Ra.B, Figure 4.8-6)
- Britton Street grade crossing: Broadway-Center Street Area, Raynham (Map No. Ra.C, Figure 4.8-6);
- West Brittania Street grade crossing: Dog Kennel and Track, Raynham (Map No. Ra.011, Figure 4.8-6);
- Dean Street grade crossing (Figure 4.8-6):
    - Taunton Center Area, Taunton (Map No. Ta.B)
    - William Woodward House, Taunton (Map No. Ta.020, Ta.C)
    - Charles R. Atwood House, Taunton (Map No. Ta.021, Ta.C)

Weir Street and Bow Street grade crossings and Traction power facility TP-05, Paralleling Station (PS-2): High Street Area, Taunton (Ta.D, Figure 4.8-6)

Table 4.8-4 summarizes the adverse effects likely to result from reconstructing the Stoughton Electric Alternative.

Table 4.8-4 Potential Adverse Effects to Historic Resources, Stoughton Line Electric Alternative

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ca.C	Canton	Washington Street	No	Yes: Moderate to severe train noise (in some locations)	Yes: Moderate, in vicinity of new catenary and station	Visual
Ca.H	Canton	Washington Street/Canton Center	No	Yes: Moderate to severe train noise (in some locations)	Yes: Moderate, in vicinity of new catenary and station	Visual
Ca.001	Canton	Canton Junction Railroad Station	Possible	n/a	Yes: Severe, adjacent to new catenary; Moderate, modifications to site	Physical (possible) Visual (possible)
Ca.006	Canton	Canton Public Library	No	No	Yes: Moderate, in vicinity of new catenary	Visual
Ca.007	Canton	Forge Pond Railroad Bridge	Possible	n/a	Yes: Severe, in close proximity to new catenary, and in vicinity of traction power facility	Physical
Ca.024	Canton	Canton Water Works	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
St.B	Stoughton	Downtown Stoughton Area	No	Yes: Moderate to severe train and horn noise (in some portions of area)	Yes: Moderate, in vicinity of new catenary	Noise Visual
St.022	Stoughton	Pearl Street Cemetery	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
St.023, St.B	Stoughton	Stoughton Town Hall	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
St.025	Stoughton	Stoughton Old Colony Railroad Station	No	n/a	Yes: Severe, adjacent to new catenary; Moderate, modifications to site	Visual
St.046	Stoughton	Meade Rubber Company	No	n/a	Yes: Severe, adjacent to new catenary and grade crossing systems	Demolition

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ea.B	Easton	North Easton Historic District	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of new catenary, station, and grade crossing systems	Noise Visual
Ea.C	Easton	Holmes-Linden Street Area	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing systems	Noise Visual
Ea.D	Easton	H.H. Richardson Historic District	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of new catenary, station, and grade crossing systems	Noise Visual
Ea.E	Easton	Center Street Area	No	Yes: Moderate to severe train and horn noise (in some portions of area)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing	Noise Visual
Ea.F	Easton	Easton Center Area	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing	Noise Visual
Ea.G	Easton	Hayward - Pool Area	No	Yes: Moderate train and moderate to severe horn noise (at edge of area)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing	Noise Visual
Ea.003	Easton	Old Colony Railroad Station	No	n/a	Yes: Severe, adjacent to new catenary, Moderate station and site modifications, and grade crossing	Visual (possible)
Ea.008, Ea.A, Ea.B (contributing)	Easton	Dighton & Somerset Line	Yes: Construction and alteration	n/a	Yes: new catenary, and grade crossing	Direct Visual (possible)
Ra.B	Raynham	Carver Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, in vicinity of new catenary and grade crossing systems	Noise Visual

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ra.011	Raynham	Dog Kennel and Track Property	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, in vicinity of new catenary and grade crossing (at edge of property)	Visual
Ta.B	Taunton	Taunton Center Area	No	Yes: Moderate to severe train and horn noise (in some portions of area)	Yes: Moderate to severe, in vicinity of new catenary, station, and grade crossing	Noise Visual
Ta.C	Taunton	Taunton Multiple Resource Area	Refer to individual properties in Ta.C below (MPS)*	Refer to individual properties in Ta.C below (MPS)	Refer to individual properties in Ta.C below (MPS)	Refer to individual properties in Ta.C below (MPS)
Ta.D	Taunton	High Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary	Noise Visual
Ta.L	Taunton	Hart Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary	Noise Visual
Ta.18, Ta.C	Taunton	Dean-Hartshorn House	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary	Noise Visual
Ta.020, Ta.B, Ta.C	Taunton	William Woodward House	No	Yes: Severe train and horn noise	Yes: Moderate, in vicinity of new catenary and grade crossing	Noise Visual
Ta.021, Ta.B, Ta.C	Taunton	Charles R. Atwood House	No	Yes: Moderate train and severe horn noise	Yes: Moderate, in vicinity of new catenary and grade crossing	Noise Visual
Ta.022, Ta.B, Ta.C	Taunton	Theodore Dean House	No	Yes: Severe horn noise	Yes: Moderate, in vicinity of new catenary and grade crossing	Noise Visual
Ta.029, Ta.B, Ta.C	Taunton	Neck of Land Cemetery	No	Yes: Moderate to severe horn noise	Yes: Severe, adjacent to new catenary	Noise Visual

* MPS: Multiple Property Submission

Archaeological Resources

The Stoughton Electric APE includes the existing and abandoned railroad right-of-way, the proposed frontage road in Stoughton, the new grade separation at Broadway Street (Route 138) in Raynham, and

any other work areas including electrification infrastructure that would involve earthmoving outside of the previously disturbed railroad right-of-way.

Intensive (Locational) survey completed for the Stoughton Alternative identified 14 archaeological sites. The Corps, in consultation with the Massachusetts SHPO and the Wampanoag Tribe of Gay Head, have determined that 10 of the 14 sites are eligible for listing in the National Register. The following discussion begins with the Stoughton Line segment of the alternative. The archaeological sites identified during the Intensive (locational) Survey for the Stoughton Line portion are presented in Table 4.8-5. The proposed grade separation at the Broadway Street (Route 138) crossing is assessed as having a moderate sensitivity for pre-contact Native American and under-documented post-contact EuroAmerican archaeological sites. An intensive (locational) archaeological survey is needed to identify archaeological sites. Project impacts will be assessed once the intensive survey is completed and when more detailed design information is available. The Corps is developing a PA to ensure that all eligible historic properties are identified and addressed as site designs and/or construction plans progress. The draft PA is attached to this document as Appendix 4.8-A.

Table 4.8-5 Archaeological Sites Identified for the Stoughton Line Segment

Site Name	Identified Cultural Deposits	Preliminary (Approximate) Site Boundaries	NR Eligibility/ Recommendation	Project Alternative
Easton Village Station Railroad Site	Mid-19th-mid-20th c. railroad depot water tower and shed remains and artifact assemblage	Within proposed station footprint: 25-x-125 m (3125 sq. m)	Not NR eligible (low research value)	Stoughton and Whittenton Alternatives
Skunk Trapper Site	11 chipping debris	Within proposed substation footprint: 45-x-80 m (3600 sq. m)	NR eligible	Stoughton and Whittenton Alternatives
Saws Wood Site	4 chipping debris	Within right-of-way: 10-x-20 m (200 sq. m)	NR eligible	Stoughton and Whittenton Alternatives
King Philip Street	1 chipping debris and 1 projectile point tip	Within right-of-way: 10-x-20 m (200 sq. m)	NR eligible	Stoughton Alternatives
Chickering Road Site	39 chipping debris and 1 cobble cortex fragment	Within right-of-way: 10-x-20 m (200 sq. m)	NR eligible	Stoughton Alternatives
East Britannia Street Site	22 chipping debris and 1 quartz scraper	Within right-of-way: 10-x-20 m (200 sq. m)	NR eligible	Stoughton Alternatives

The proposed frontage road in Stoughton along the Stoughton line right-of-way is assessed as having low archaeological sensitivity. No impacts to archaeological sites are identified for this work element.

There is the possibility that proposed overhead catenary structure support footings and deep pile foundations for the proposed trestle in the Hockomock Swamp could extend into archaeologically sensitive strata below rail bed disturbance and fill deposits. Specific sensitivity areas would be determined based on a review of soil borings and/or a detailed soil profile of the right-of-way using soil boring logs.

An intensive (locational) survey was conducted and resulted in the location of five archaeological sites which are eligible for the National Register. Additionally, four historic refuse deposits were identified but are not considered archaeological sites. This alternative would have no effect on these refuse deposits, but may affect the pre-contact archaeological sites.

The archaeological survey has not yet been conducted for track improvements including electrification infrastructure that would involve earthmoving outside of the previously disturbed railroad right-of-way within the APE. Project impacts to archaeological resources in these portions of the Stoughton Electric APE will be assessed when more detailed design information is available, as defined in the PA (Appendix 4.8-A).

Appendix 4.8-C presents the results of the archaeological survey within the Stoughton Line portion of the APE.

4.8.3.2 Stoughton Diesel Alternative

The Stoughton Diesel Alternative is identical to the Stoughton Electric Alternative with the exception of the electrical infrastructure including the substations and the overhead catenary system that are not required for the diesel-powered train service.

Cultural resources surveys were conducted for the Stoughton Diesel Alternative elements and impacts to identified resources are presented below.

Historic Resources

The impacts to historic resources along the Stoughton Line segment of the Stoughton Diesel Alternative may be permanent or temporary, direct or indirect. A total of 26 historic properties (located within the Stoughton Line APE may be affected by the project. Figures 4.8-2 to 4.8-6 show the location of historic resources along the Stoughton Line. Appendix 4.8-B, presents the potential impacts to historic resources for the Stoughton Diesel Alternative.

Direct Impacts

Direct impacts for the Stoughton Line segment of the Stoughton Diesel Alternative are identical to the electric option though the electrical infrastructure is not involved.

Indirect Impacts

Indirect impacts for the Stoughton Line segment of the Stoughton Diesel Alternative are similar to the electric option, with the exception of any impacts from the electrical power infrastructure. Therefore, the diesel option would result in less visual impact.

Table 4.8-6 summarizes the adverse effects likely to result from reconstructing the Stoughton Diesel Alternative.

Table 4.8-6 Potential Adverse Effects to Historic Resources, Stoughton Line Diesel Alternative

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ca.C	Canton	Washington Street	No	Yes: Moderate to severe train noise (in some locations)	Yes: Moderate, in vicinity of new catenary and station	Visual
Ca.H	Canton	Washington Street/Canton Center	No	Yes: Moderate to severe train noise (in some locations)	Yes: Moderate, in vicinity of new catenary and station	Visual
Ca.001	Canton	Canton Junction Railroad Station	Possible	n/a	Yes: Moderate, modifications to site	Physical (possible) Visual (possible)
Ca.007	Canton	Forge Pond Railroad Bridge	Possible	n/a	Yes: Severe, in vicinity of traction power facility	Physical
St.B	Stoughton	Downtown Stoughton Area	No	Yes: Moderate to severe train and horn noise (in some portions of area)	No	Noise
St.023, St.B	Stoughton	Stoughton Town Hall	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
St.025	Stoughton	Stoughton Old Colony Railroad Station	No	n/a	Yes: Moderate, modifications to site	Visual
St.046	Stoughton	Meade Rubber Company	No	n/a	Yes: Severe, adjacent to grade crossing systems	Demolition
Ea.B	Easton	North Easton Historic District	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of new station, and grade crossing systems	Noise Visual
Ea.C	Easton	Holmes-Linden Street Area	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of grade crossing systems	Noise Visual
Ea.D	Easton	H.H. Richardson Historic District	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of new station, and grade crossing systems	Noise Visual

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ea.E	Easton	Center Street Area	No	Yes: Moderate to severe train and horn noise (in some portions of area)	Yes: Moderate to severe, in vicinity of grade crossing	Noise Visual
Ea.F	Easton	Easton Center Area	No	Yes: Moderate to severe train and horn noise (in some portions of district)	Yes: Moderate to severe, in vicinity of grade crossing	Noise Visual
Ea.G	Easton	Hayward - Pool Area	No	Yes: Moderate train and moderate to severe horn noise (at edge of area)	Yes: Moderate to severe, in vicinity of grade crossing	Noise Visual
Ea.003	Easton	Old Colony Railroad Station	No	n/a	Yes: Moderate station and site modifications, and grade crossing	Visual (possible)
Ea.008, Ea.A, Ea.B (contributing)	Easton	Dighton & Somerset Line	Yes: Construction and alteration	n/a	Yes: new catenary, and grade crossing	Direct Visual (possible)
Ra.B	Raynham	Carver Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, in vicinity of grade crossing systems	Noise Visual
Ra.011	Raynham	Dog Kennel and Track Property	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, in vicinity of grade crossing (at edge of property)	Visual
Ta.B	Taunton	Taunton Center Area	No	Yes: Moderate to severe train and horn noise (in some portions of area)	Yes: Moderate to severe, in vicinity of new station, and grade crossing	Noise Visual
Ta.C	Taunton	Taunton Multiple Resource Area	Refer to individual properties in Ta.C below (MPS)	Refer to individual properties in Ta.C below (MPS)	Refer to individual properties in Ta.C below (MPS)	Refer to individual properties in Ta.C below (MPS)
Ta.D	Taunton	High Street Area	No	Yes: Moderate to severe train and horn noise	No	Noise

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ta.L	Taunton	Hart Street Area	No	Yes: Moderate to severe train and horn noise	No	Noise
Ta.18, Ta.C	Taunton	Dean-Hartshorn House	No	Yes: Moderate to severe train and horn noise	No	Noise
Ta.020, Ta.B, Ta.C	Taunton	William Woodward House	No	Yes: Severe train and horn noise	Yes: Moderate, in vicinity of grade crossing	Noise Visual
Ta.021, Ta.B, Ta.C	Taunton	Charles R. Atwood House	No	Yes: Moderate train and severe horn noise	Yes: Moderate, in vicinity of grade crossing	Noise Visual
Ta.022, Ta.B, Ta.C	Taunton	Theodore Dean House	No	Yes: Severe horn noise	Yes: Moderate, in vicinity of grade crossing	Noise Visual
Ta.029, Ta.B, Ta.C	Taunton	Neck of Land Cemetery	No	Yes: Moderate to severe horn noise	No	Noise

Archaeological Resources

The effects to archaeological resources for the Stoughton Diesel Alternative will be the same as for the Stoughton Electric Alternative with the exception of any impacts from the electrical power infrastructure.

4.8.3.3 Whittenton Alternatives

The Whittenton Electric Alternative is a variant of the Stoughton Electric Alternative alignment described in Section 4.8.3.1. At Raynham Junction, the line would divert to the southwest, following the old, unused Whittenton Branch railroad line. This alignment would connect with the Attleboro Secondary near the Whittenton neighborhood in Taunton then continue on toward the southeast to connect with the New Bedford Main Line at Weir Junction.

This alternative would consist of 3.48 miles of single track on the Whittenton Branch, 1.62 miles of single track on the Attleboro Secondary, and 0.62 mile of double track on the Attleboro Secondary west of Weir Junction. New grade crossings would be built and equipment installed. New catenary supports, wires, and a new traction power system would be constructed along the length of the line. Stations along the Stoughton Line portion of this alternative are the same as Stoughton Alternatives, except for Taunton Station. No traction power facilities, new stations, or layover facilities would be constructed within the Whittenton Branch corridor.

The results of the cultural resources intensive surveys for the Whittenton Electric Alternative elements, and impacts to identified resources are presented below. This section discusses first the Whittenton Branch right-of-way, followed by the Attleboro Secondary right-of-way.

Whittenton Branch Right-of-way of the Whittenton Electric Alternative

Historic Resources

The impacts to historic resources along the Whittenton Branch segment of the Whittenton Electric Alternative of the project may be permanent or temporary, direct or indirect (Table 4.8-7). A total of 4 historic districts located within the Whittenton Branch Line APE may be affected by the project's electric option. Figures 4.8-7 and 4.8.8 show the location of historic resources along the Whittenton Branch Line. Appendix 4.8-B presents the potential impacts to historic resources for the Whittenton Branch of the Whittenton Electric Alternative. North of the Whittenton Branch and Raynham Junction, the Whittenton Electric Alternative may affect the properties located on the Stoughton Line as described above, in addition to the properties of the Southern Triangle described below.

Table 4.8-7 Potential Adverse Effects to Historic Resources, Attleboro Secondary and Whittenton Branch, Whittenton Electric Alternative

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ta.C	Taunton	Taunton Multiple Resource Area	See individual properties in Ta.C below	See individual properties in Ta.C below	See individual properties in Ta.C below	See individual properties in Ta.C below
Ta.F	Taunton	Whittenton Mill Area	No	Yes: Moderate to severe train and horn noise (in some locations)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing systems (in some locations)	Noise Visual
Ta.H	Taunton	Reed and Barton Worker Housing	No	Yes: Moderate to severe horn noise (in some locations)	Yes: Moderate, in vicinity of new catenary and grade crossing systems (in some locations)	Noise Visual
Ta.D	Taunton	High Street Area	No	Yes: Moderate train noise (at edge of area)	Yes: Moderate, in vicinity of new catenary, grade crossing, and traction power facility	Noise Visual
Ta.I	Taunton	Ancient Whittenton Area	No	Yes: Moderate to severe train and horn noise (in some locations)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing systems (in some locations)	Noise Visual
Ta.R	Taunton	Multiple	No	Yes: Moderate train and horn noise	Yes: Moderate, portions of area are in vicinity of new catenary	Visual

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ta.S	Taunton	Danforth St, Dana St	No	Yes: Moderate train and horn noise	Yes: Moderate, portions of area are in vicinity of new catenary	Visual
Ta.T	Taunton	Tremont St	No	Yes: Moderate train and severe horn noise	Yes: Moderate, portions of area are in vicinity of new catenary	Noise Visual
Ta.208, Ta.C	Taunton	St. Thomas Episcopal Church	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of new catenary and traction power facility	Visual
Ta.209, Ta.C	Taunton	McKinstrey House	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of new catenary and traction power facility	Visual
Ta.211, Ta.C	Taunton	Henry G. Brownell House (Elk's Lodge No. 150)	No	Yes: Moderate to severe horn noise	Yes: Moderate, in vicinity of new catenary and traction power facility	Noise Visual
Ta.245, Ta.C	Taunton	Lord-Baylies-Bennett House (Taunton Masonic Lodge)	No	Yes: Moderate train and severe horn noise	Yes: Moderate, in vicinity of new catenary	Noise Visual
Ta.246, Ta.C	Taunton	Samuel Washburn House	No	Yes: Moderate to severe train and severe horn noise	Yes: Severe, adjacent to new catenary	Noise Visual
Ta.254, Ta.C	Taunton	Samuel Colby House	No	Yes: Moderate train and severe horn noise	Yes: Moderate, in vicinity of new catenary	Noise Visual
Ta.259, Ta.C, Ta.V	Taunton	Sarah A. Haskins House	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of new catenary	Visual
Ta.262	Taunton	Mount Pleasant Cemetery	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of new catenary	Visual
Ta.266, Ta. C	Taunton	J.C. Bartlett House	No	Yes: Moderate train and severe horn noise	Yes: Severe, adjacent to new catenary	Noise Visual
Ta.294, Ta.C, Ta.D	Taunton	H.B. Lothrop Store	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of new catenary	Visual
Ta.309, Ta.C	Taunton	William Lawrence House	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of new catenary	Visual

Direct Impacts

Direct impacts for the Whittenton Branch electric option will be similar to the other electric alternatives, but will include clearing and grading and construction of new track and grade crossings along the abandoned line.

There will be no direct impacts to historic resources for new grade crossings work within the right-of-way, and no traction power facilities are proposed.

Indirect Impacts

Indirect impacts from the Whittenton Electric Alternative would be similar to the Stoughton Electric Alternative, but would also involve clearing that would increase the visibility of the newly reactivated right-of-way from nearby historic properties. The abandoned right-of-way crosses or is adjacent to five historic districts.

Train operations and horn blowing will result in moderate to severe, or severe noise that may require noise barrier or sound insulation at the following historic resources:

- Dean and Whittenton Streets grade crossings: Taunton MRA (Map No. Ta.C, Figure 4.8-8)
- Whittenton Street grade crossing (Figure 4.8-7):
  - Whittenton Mill Area (Map No. Ta.F)
  - Reed and Barton Worker Housing (Map No. Ta.H)
- Warren Street grade crossing: Ancient Whittenton Area (Map No. Ta.I, Figure 4.8-7).

Archaeological Resources

The Whittenton Electric APE includes the abandoned railroad right-of-way and any other work areas including electrification infrastructure that would involve earthmoving outside of the former railroad right-of-way. Table 4.8-8 presents the archaeological sites identified for Whittenton Branch and Attleboro Secondary segments of the Whittenton Alternatives.

Four archaeological sites are located within the Whittenton Electric former right-of-way portion of the APE along the Whittenton Branch alignment. The four sites have been determined by the Corps, in consultation with the Massachusetts SHPO and the Aquinnah THPO, to be eligible for the National Register. Project impacts to archaeological resources in the Whittenton Electric APE will be assessed when more detailed design information is available.

Table 4.8-8 Archaeological Sites identified for the Whittenton Branch Rail Segment

Site Name	Identified Cultural Deposits	Preliminary (Approximate) Site Boundaries	NR eligibility/ recommendation	Project Alternative
Mel's Diner Site	5 chipping debris	Within right-of-way: 10-x-10 m (100 sq. m)	NR eligible	Whittenton Alternative
Pine Crest Site	1 chipping debris	Within right-of-way: 10-x-20 m (200 sq. m)	NR eligible	Whittenton Alternative
ATV Trail Site	1 chipping debris and 1 hammerstone	Within right-of-way: 10-x-10 m (100 sq. m)	NR eligible	Whittenton Alternative
Cedar Swamp Site	35 chipping debris, fire-cracked rock, fire pit feature	Within right-of-way: 27-x-30 m (810 sq. m)	NR eligible	Whittenton Alternative

Attleboro Secondary Right-of-way of the Whittenton Electric Alternative

Existing freight track within the Attleboro Secondary would be upgraded and the line would be single track between the Whittenton Junction and Taunton, with the remaining 0.62 mile to Weir Junction being double track. New catenary supports, wires, and a traction power system would be constructed along the length of the line. One new train station would be constructed in Taunton (Dana Street Station). No new layover facilities would be constructed along this alternative segment.

Historic Resources

The impacts to historic resources along the Attleboro Secondary segment of the Whittenton Electric Alternative may be permanent or temporary, direct or indirect. A total of 15 historic properties located within the Attleboro Secondary APE may be affected by the project. Figures 4.8-8 to 4.8-9 show the location of historic resources along the Attleboro Secondary.

Direct Impacts

Direct impacts for the Attleboro Secondary electric option will be similar to the other project electric alternatives (discussed above).

The construction of the Attleboro Secondary segment of the Whittenton Electric Alternative will occur within the right-of-way. Both paralleling stations (listed above) would be constructed within existing right-of-way as well. There are no historic resources located within these construction areas. Therefore, there are no permanent direct impacts of the project on historic resources within the Attleboro Secondary APE.

Indirect Impacts

Indirect impacts for the Attleboro Secondary electric option will be similar to the other project electric alternatives described above.

The introduction of additional rail service will result in increased noise during operations from train noise and horn blowing at grade crossings. The noise increase will cause moderate to severe or severe noise at residential, contemplative, and quiet setting historic resources at the following grade crossing locations. These specific areas and resources would likely require sound insulation or barrier mitigation:

- Weir Street and Bow Street grade crossings: High Street Area, Taunton (Map No. Ta.D; Figure 4.8-8)
- Danforth Street grade crossing (Figure 4.8-8):
    - Massachusetts State Hospitals and State Schools, Taunton (Map No. Ta.R)
    - Taunton State Hospital Historic District, Taunton (Map No. Ta.S)
- Tremont Street grade crossing (Figure 4.8-8):
    - Tremont Street Area, Taunton (Map No. Ta.T)
    - Hodges Avenue Area, Taunton (Map No. Ta.U)
- Winthrop Street and Webster Street grade crossings: Harrison Street Area, Taunton (Map No. Ta.V, Ta.D; Figure 4.8-8)
- Porter Street and Cohannet Street grade crossings (Figure 4.8-8):
    - St. Thomas Episcopal Church, Taunton (Map No. Ta.208, Ta.C)
    - Henry G. Brownell House, Taunton (Elks Lodge No. 150) (Map No. Ta.211, Ta.C)
- Winthrop Street, Porter Street, and Cohannet Street grade crossings (Figure 4.8-8):
    - Lord-Baylies-Bennett House, Taunton (Taunton Masonic Lodge) (Map No. Ta.245, Ta.C)
    - Samuel Washburn House, Taunton (Map No. Ta.246, Ta.C)
- Winthrop Street and Cohannet Street grade crossings: Samuel Colby House, Taunton (Map No. Ta.254, Ta.C; Figure 4.8-8)
- Winthrop Street grade crossings: J.C. Bartlett House, Taunton (Map No. Ta.266, Ta.C; Figure 4.8-8)
- Barnum Street and Weir Street grade crossings: William Lawrence House, Taunton (Map No. Ta.309,Ta.C; Figure 4.8-8)

TP-21, paralleling station (PS-2) in Taunton (Figure 4.8-8) may cause adverse visual effects to four adjacent historic properties through the introduction of modern power structures that alter the historic setting:

- Henry G. Brownell House (Map No. Ta.211)

- McKinstrey House (Map No. Ta.209)
- Rhodes Button Company (Map No. Ta.225); and Thomas Episcopal Church (Map No. Ta.208)

Table 4.8-9 summarizes the adverse effects likely to result from reconstructing the Attleboro Secondary segment of the Whittenton Electric Alternative.

Table 4.8-9 Potential Adverse Effects to Historic Resources, Whittenton Branch and Attleboro Secondary Rail Segments, Whittenton Diesel Alternative

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ta.C	Taunton	Taunton Multiple Resource Area	See Individual properties in Ta.C below	See individual properties in Ta.C below	See individual properties in Ta.C below	See individual properties in Ta.C below
Ta.F	Taunton	Whittenton Mill Area	No	Yes: Moderate to severe train and horn noise (in some locations)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing systems (in some locations)	Adverse: Noise Visual
Ta.H	Taunton	Reed and Barton Worker Housing	No	Yes: Moderate to severe horn noise (in some locations)	Yes: Moderate, in vicinity of new catenary and grade crossing systems (in some locations)	Adverse: Noise Visual
Ta.D	Taunton	High Street Area	No	Yes: Moderate train noise (at edge of area)	Yes: Moderate, in vicinity of new catenary, grade crossing, and traction power facility	Adverse: Noise Visual
Ta.I	Taunton	Ancient Whittenton Area	No	Yes: Moderate to severe train and horn noise (in some locations)	Yes: Moderate to severe, in vicinity of new catenary and grade crossing systems (in some locations)	Adverse: Noise Visual
Ta.T	Taunton	Tremont St	No	Yes: Moderate train and severe horn noise	No	Adverse: Noise
Ta.208, Ta.C	Taunton	St. Thomas Episcopal Church	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of traction power facility	Adverse: Visual
Ta.209, Ta.C	Taunton	McKinstrey House	No	Yes: Moderate horn noise	Yes: Moderate, in vicinity of traction power facility	Adverse: Visual

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ta.211, Ta.C	Taunton	Henry G. Brownell House (Elk's Lodge No. 150)	No	Yes: Moderate to severe horn noise	Yes: Moderate, in vicinity of traction power facility	Adverse: Noise Visual
Ta.245, Ta.C	Taunton	Lord-Baylies-Bennett House (Taunton Masonic Lodge)	No	Yes: Moderate train and severe horn noise	No	Adverse: Noise
Ta.246, Ta.C	Taunton	Samuel Washburn House	No	Yes: Moderate to severe train and severe horn noise	No	Adverse: Noise
Ta.254, Ta.C	Taunton	Samuel Colby House	No	Yes: Moderate train and severe horn noise	Yes: Moderate, in vicinity of new catenary	Adverse: Noise Visual
Ta.266, Ta. C	Taunton	J.C. Bartlett House	No	Yes: Moderate train and severe horn noise	No	Adverse: Noise

Archaeological Resources

The Attleboro Secondary segment of the APE includes active freight right-of-way from the Attleboro Bypass and Weir Junction in Taunton. There are no recorded archaeological sites or sensitive areas within the previously disturbed Attleboro Secondary railroad right-of-way.

There is the possibility that proposed overhead catenary structure support footings could extend into archaeologically sensitive strata below rail bed disturbance and fill deposits. Specific sensitivity areas would be determined based on a review of soil borings and/or a detailed soil profile of the right-of-way using soil boring logs. An intensive (locational) survey may be needed in sensitive areas where direct physical construction impacts are planned. Project impacts to archaeological resources will be assessed when more detailed design information is available, as described in the draft PA (Appendix 4.8-A)

The archaeological survey has not yet been conducted for track improvements including electrification infrastructure that would involve earthmoving outside of the railroad right-of-way within the APE. Project impacts to archaeological resources in these portions of the Attleboro Secondary Electric APE will be assessed when more design information is available.

4.8.3.4 Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the electrical infrastructure including the overhead catenary system that is not required for the diesel-powered train service.

A historic resources survey was completed for the Whittenton Diesel Alternative and impacts to identified historic resources are presented below. This section discusses first the Whittenton Branch right-of-way segment of the Whittenton Alternative, followed by the Attleboro Secondary right-of-way segment.

Whittenton Branch Right-of-way of the Whittenton Diesel Alternative

Historic Resources

The impacts to historic resources along the Whittenton Branch segment of the Whittenton Diesel Alternative of the project may be permanent or temporary, direct or indirect. A total of 7 historic properties (1 individual and 6 historic districts) located within the Whittenton Branch Line APE may be affected by the alternative's diesel option. Figures 4.8-7 to 4.8-8 show the location of historic resources along the Whittenton Branch. Appendix 4.8-B, presents the potential impacts to historic resources for the Whittenton Diesel Alternative.

The Whittenton Diesel Alternative may affect an additional 21 properties (8 individual properties and 13 historic districts), located on the Stoughton Line north of Raynham Junction. The impacts to these properties are the same as those described in Section 4.8.3.3 above, excluding impacts pertaining to the Taunton Depot, TP-05, Paralleling Station (PS-2), and 7 historic properties located on the Stoughton Line south of Raynham Junction in Raynham and Taunton.

Direct Impacts

Direct impacts for the Whittenton Branch segment of the Whittenton Diesel Alternative are identical to the electric option.

Indirect Impacts

Indirect impacts for the Whittenton Branch segment of the Whittenton Diesel Alternative are similar to the electric option with the exception of any impacts from the electrical power infrastructure. Therefore, the diesel option will result in less visual impact.

Archaeological Resources

See discussion above for the Whittenton Branch right-of-way segment of the Whittenton Electric Alternative.

Attleboro Secondary Right-of-way of the Whittenton Diesel Alternative

Existing freight track would be upgraded and the line would be single track between the Whittenton Junction and Taunton, with the remaining 0.62 mile to Weir Junction being double track.

One new train station would be constructed in Taunton (Dana Street Station). No new layover facilities would be constructed along this alternative segment.

Historic Resources

The impacts to historic resources along the Attleboro Secondary segment of the Whittenton Diesel Alternative may be permanent or temporary, direct or indirect. A total of 28 historic properties (17 individual and 11 historic districts) located within the Attleboro Secondary APE may be affected by the project. Figure 4.8-8 shows the location of historic resources along the Attleboro Secondary. Appendix 4.8-B, presents the potential impacts to historic resources for the Whittenton Diesel Alternative.

Direct Impacts

Direct impacts for the Attleboro Secondary diesel option will be similar to the other project diesel alternatives (discussed above).

The construction of the Attleboro Secondary segment of the Whittenton Diesel Alternative will occur within the right-of-way. Both paralleling stations (listed above) would be constructed within existing right-of-way as well. There are no historic resources located within these construction areas. Therefore, there are no permanent direct impacts of the project on historic resources within the Attleboro Secondary APE.

Indirect Impacts

Indirect impacts for the Attleboro Secondary right-of-way segment of the Whittenton diesel option will be similar to the other project diesel alternatives described above.

The introduction of additional rail service will result in increased noise during operations from train noise and horn blowing at grade crossings. The noise increase will cause moderate to severe, or severe noise at residential, contemplative, and quiet setting historic resources at the following grade crossing locations. These specific areas and resources would likely require sound insulation or barrier mitigation:

- Weir Street and Bow Street grade crossings: High Street Area, Taunton (Map No. Ta.D, Figure 4.8-8)
- Danforth Street grade crossing (Figure 4.8-8):
  - Massachusetts State Hospitals and State Schools, Taunton (Map No. Ta.R)
  - Taunton State Hospital Historic District, Taunton (Map No. Ta.S)
- Tremont Street grade crossing (Figure 4.8-8):
  - Tremont Street Area, Taunton (Map No. Ta.T)
  - Hodges Avenue Area, Taunton (Map No. Ta.U)
- Winthrop Street and Webster Street grade crossings: Harrison Street Area, Taunton (Map No. Ta.V, Ta.D; Figure 4.8-8)
- Porter Street and Cohannet Street grade crossings (Figure 4.8-8):
  - St. Thomas Episcopal Church, Taunton (Map No. Ta.208, Ta.C)

  - o Henry G. Brownell House, Taunton (Elks Lodge No. 150) (Map No. Ta.211, Ta.C)

- Winthrop Street, Porter Street, and Cohannet Street grade crossings (Figure 4.8-8):

  - o Lord-Baylies-Bennett House, Taunton (Taunton Masonic Lodge) (Map No. Ta.245, Ta.C)

  - o Samuel Washburn House, Taunton (Map No. Ta.246, Ta.C)

- Winthrop Street and Cohannet Street grade crossings: Samuel Colby House, Taunton (Map No. Ta.254, Ta.C; Figure 4.8-8)

- Winthrop Street grade crossings: J.C. Bartlett House, Taunton (Map No. Ta.266, Ta.C; Figure 4.8-8)

- Barnum Street and Weir Street grade crossings): William Lawrence House, Taunton (Map No. Ta.309, Ta.C; Figure 4.8-8).

Table 4.8-9 (above) summarizes the adverse effects likely to result from reconstructing the Attleboro Secondary right-of-way segment of the Whittenton Diesel Alternative.

Archaeological Resources

The Attleboro Secondary right-of-way APE of the Whittenton Diesel Alternative includes active freight right-of-way from the Attleboro Bypass and Weir Junction in Taunton. Appendix 4.8-C presents the assessment of potential impacts to archaeological resources within the Attleboro Secondary portion of the APE.

There are no recorded archaeological sites or sensitive areas within the previously disturbed Attleboro Secondary railroad right-of-way. The archaeological survey has not yet been conducted for track improvements that would involve earthmoving outside of the railroad right-of-way within the APE. Project impacts to archaeological resources in these portions of the Attleboro Secondary APE will be assessed when more design information is available, as described in the draft PA (Appendix 4.8-A).

Direct Impacts

Direct impacts for the Attleboro Secondary segment of the Whittenton Diesel Alternative are identical to the electric option.

Indirect Impacts

Indirect impacts for the Attleboro Secondary segment of the Whittenton Diesel Alternative are similar to the electric option with the exception of any impacts from the electrical power infrastructure. Therefore, the diesel option will result in less visual impact. Table 4.8-9 (above) summarizes the adverse effects likely to result from constructing the Whittenton Diesel Alternative.

Archaeological Resources

The Attleboro Secondary right-of-way segment of the Whittenton Electric Alternative is an active line and has not yet been assessed for archaeological resources. Additional cultural resources studies may be needed for this segment of the Whittenton Alternative.

4.8.3.5 Southern Triangle

The Southern Triangle consists of the active freight rail tracks with existing grade crossings of the Fall River Secondary from Myricks Junction in Berkley to Fall River and the New Bedford Main Line from Weir Junction in Taunton to New Bedford and a portion of the Attleboro Secondary between Myricks Junction and Weir Junction. Both diesel and electrification options are being considered for these rail lines.

The Southern Triangle is common to both the Stoughton and Whittenton Alternatives as are the six stations (Battleship Cove, East Taunton, Fall River Depot, Freetown, King's Highway, and Whale's Tooth). Cultural resources survey was conducted for the Southern Triangle elements, and impacts to identified resources are presented below.

Fall River Secondary

Existing freight track would be upgraded and a short segment of the line would be double track south of Myricks Junction, for a distance of 0.61 mile. The remainder of the line would be single track, with the exception of two small double track sections in Freetown and Fall River, 0.62 and 0.71 mile long, respectively.

New catenary supports, wires, and one new traction power facility (TP-11, Paralleling Station [(PS-05]) at a specified location would be constructed along the length of the line for the electrification option. Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one new station would be constructed in Freetown (Freetown). One new layover facility would be constructed in Fall River, at the Weaver's Cove East location.

Potential Adverse Effects on Historic Resources along the Fall River Secondary Rail Segment

The impacts of the South Coast Rail project to historic resources along the Fall River Secondary line of the Southern Triangle segment of the project may be permanent or temporary, direct or indirect. For the two options (electric and diesel), there is a combined total of 22 historic properties (Table 4.8-10). The locations of these structures and districts along the Fall River Secondary are shown in Figures 4.8-14 through 4.8-16. Appendix 4.8-B, Tables 1 and 2, present the data on the individual structures and districts.

Work elements and impacts discussed in this section apply to, but are not repeated in, subsequent sections for the different electric and diesel alternatives.

Table 4.8-10 Southern Triangle, Fall River Secondary–Affected Historic Resources

Option	Historic – Individual	Historic Districts	Figure	Appendix
Electric	12	10	Figures 4.8-14 through 4.8-16	Appendix 4.8-B
Diesel	6	6	Figures 4.8-14 through 4.8-16	Appendix 4.8-B

Direct Impacts on Historic Resources along the Fall River Secondary Rail Segment

Project work elements for the Fall River Secondary electric option include railroad upgrade (track, railroad bed, bridges and culverts, fencing in populated areas), at-grade crossing improvements (equipment, signage, traffic control), and electrical infrastructure (catenary and traction power

facilities). Direct permanent impacts from work within the existing right-of-way rail corridor are not likely to affect significant historic resources, with the exception of bridges and grade crossings.

Direct impacts from improvements to existing at-grade crossings within historic districts and immediately adjacent to individual historic resources are expected to be minor, provided that no roadway changes are proposed. No direct impacts are anticipated from the new traction power facility, TP-10, Paralleling Station (PS-04), as there are no historic resources on the site. Station impacts are discussed below in Section 4.8.3.6. If noise mitigation insulating treatments on historic buildings are warranted to address indirect effects, these treatments may include new windows and doors. The replacement of windows and doors will have a direct effect on the subject properties and will require design considerations for compatibility with historic resources.

Project work elements and direct impacts for the Fall River Secondary diesel option are identical to the electric option, with the exception of any impacts from the electrical power infrastructure.

Indirect Impacts on Historic Resources along the Fall River Secondary Rail Segment

Indirect impacts from the Fall River Secondary electric option may include auditory, vibration, visual, or other environmental effects on the setting or other character-defining features of individual historic individual properties and districts. Indirect impacts from the addition of upgraded existing track and existing grade crossing rail infrastructure elements in the active right-of-way are generally anticipated to be low.

The introduction of additional rail service will result in increased noise during operations from train noise and horn blowing at grade crossings. The noise increase will cause moderate to severe or severe noise at residential, contemplative, and quiet setting historic resources at the following grade crossing locations. These specific areas and resources could require sound insulation or barrier mitigation to reduce noise impacts. An elastic mat may be placed under the ballast to absorb or reduce vibration levels before they enter the ground and propagate to nearby receptors, as described in Chapter 4.7, *Vibration.*

- At Myricks Street and Mill Street grade crossings: Myricks Street Area, Berkley (Map No. Be.C, Figure 4.8-14)
- At Adams Lane grade crossing: Peirce and Haskins Cemetery, Lakeville (Map No. La.024; Figure 4.8-14)
- At Elm Street, Forge Road, and Richmond Road grade crossings: Slab Bridge Road Area, Freetown (Map No. Ft.C, Figure 4.8-15)
- At Richmond Road and Beechwood Road grade crossings: Richmond Road/ Maple Tree Crossing Bridge, Freetown (Map No. Ft.009, Figure 4.8-14)

Similarly, moderate to severe noise from operations may be experienced at the following resources or districts. These specific areas and resources also would likely require sound insulation or barrier mitigation:

- Assonet Historic District, Freetown (Map No. Ft.D, Figure 4.8-15)

- North Main Street Area, Fall River (Map No. FR.D, Figure 4.8-16)
- Wellington-Brownell Street Area, Fall River (Map No. FR.I, Figure 4.8-16)
- North Burial Ground, Fall River (Map No. FR.K, FR.C; Figure 4.8-16)
- Pearce-Durfee Street Area, Fall River (Map No. FR.M, Figure 4.8-16)
- St. Michael's Roman Catholic Church, Fall River (Map No. FR.050, Figure 4.8-16)
- Al Mac's Diner, Fall River (Map No. FR.070, FR,M; Figure 4.8-16)
- Residence, 524 Durfee Street, Fall River (Map No. FR.081, Figure 4.8-16)

New construction including stations (see Section 4.8.3.6 below), the new traction power facility, catenary systems, bridge modifications and replacements, right-of-way fencing, and noise mitigation barriers may have indirect visual impacts on adjacent historic architectural resources and their settings. The new catenary system along the right-of-way will have a moderate to severe visual effect on several of the residential, commercial, and landscape (but not on industrial or transportation) historic resources throughout the rail corridor (see list in Appendix 4.8-B). The traction power facility TP-11, Paralleling Station (PS-05) will have a moderate to severe visual effect on the Pearce-Durfee Street Area, Fall River (Map No. FR.L, Figure 4.8-16). Right-of-way fencing and noise mitigation barriers in and adjacent to historic districts and individual properties will have an effect on the setting of those historic resources by introducing new chain link fence and solid walls that alter the historic character of the area.

Indirect impacts for the Fall River Secondary diesel option are similar to the electric option, with the exception of those generated by electrical catenary and traction power infrastructure (see list in Appendix 4.8-B). Therefore, the diesel option will result in less visual impact.

Tables 4.8-11 and 4.8-12, below, summarize the adverse effects likely to result from reconstructing the Fall River Secondary, for the electric and diesel alternatives.

Table 4.8-11 Potential Adverse Effects to Historic Resources, Fall River Secondary (Electric Alternatives)

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
La.024	Lakeville	Peirce and Haskins Cemetery	No	Yes: Severe train and horn noise	Yes: Moderate, in vicinity of new catenary	Noise Visual
Be.C	Berkley	Myricks Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary, and traction power facility	Noise Visual

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Ft.C	Freetown	Slab Bridge Road Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary	Noise Visual
Ft.D	Freetown	Assonet Historic District	No	Yes: Moderate to severe train and horn noise	Yes: Moderate, portion of edge of area is in vicinity of new catenary	Noise Visual
Ft.009	Freetown	Richmond Road / Maple Tree Crossing Bridge	No	n/a	Yes: Moderate, in vicinity of new catenary	Visual
FR.C	Fall River	Fall River Multiple Resource Area	Refer to individual properties in MPS and properties in FR.C below	Refer to individual properties in MPS and properties in FR.C below	Refer to individual properties in MPS and properties in FR.C below	Refer to individual properties in MPS and properties in FR.C below
FR.D	Fall River	North Main Street Area	Yes: Layover construction	Yes: Moderate to severe train noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary and layover	Physical Noise Visual
FR.K, FR.C	Fall River	North Burial Ground	No	Yes: Moderate to severe train noise	Yes: Severe, adjacent to new catenary	Noise Visual
FR.L	Fall River	Durfee Street Area	No	Yes: Moderate to severe train noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary, station, and traction power facility	Noise Visual
FR.M	Fall River	Diners of Massachusetts	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
FR.N, FR.C	Fall River	American Printing Company - Metacomet Mill	No	n/a	Yes: Moderate to severe, portions of area are in vicinity of new catenary and station	Visual
FR.Q	Fall River	St. Michael's Roman Catholic Church Complex	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of new catenary	Noise Visual
FR.003	Fall River	Joel Hathaway House	No	Yes: Moderate train noise	No: RR in deep cut section	No Adverse Effect

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
FR.005, FR.C	Fall River	William Collins House	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
FR.006, FR.C	Fall River	North Christian Congregational Church	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
FR.010, FR.C	Fall River	Borden-Winslow House	No	No	Yes: Moderate, in vicinity of new catenary	Noise Visual
FR.012, FR.C	Fall River	Canedy, Squire William B. House	No	No	Yes: Moderate, in vicinity of new catenary, layover facility	Visual (catenary)
FR.017	Fall River	Residence, 311 Crescent St	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
FR.026, FR.C	Fall River	Brightman, Hathaway House	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
FR.050	Fall River	St. Michael's Roman Catholic Church	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of new catenary	Noise Visual
FR.052	Fall River	St. Matthews Convent	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of new catenary	Noise Visual
FR.053	Fall River	St. Matthews School	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of new catenary	Noise Visual

Table 4.8-12 Potential Adverse Effects to Historic Resources, Fall River Secondary (Diesel Alternatives)

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
Be.C	Berkley	Myricks Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary, and traction power facility	Noise Visual
La.024	Lakeville	Peirce and Haskins Cemetery	No	Yes: Severe train and horn noise	No	Noise
Ft.C	Freetown	Slab Bridge Road	No	Yes:	No	

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
		Area		Moderate to severe train and horn noise		Noise
Ft.D	Freetown	Assonet Historic District	No	Yes: Moderate to severe train and horn noise	No	Noise
FR.D	Fall River	North Main Street Area	Layover construction	Moderate to severe train noise	Severe, portion of area is within layover site	Physical Noise Visual
FR.010, FR.C	Fall River	Borden-Winslow House	No	No	No	Noise
FR.K, FR.C	Fall River	North Burial Ground	No	Moderate to severe train noise	No	Noise
FR.L	Fall River	Pearce-Durfee Street Area	No	Moderate to severe train noise	Moderate to severe, portion of area is in vicinity of new station	Noise Visual
FR.N, FR.C	Fall River	American Printing Company - Metacomet Mill	No	n/a	Moderate, in vicinity of new station	Visual
FR.050	Fall River	St. Michael's Roman Catholic Church	No	Yes: Moderate to severe train noise	No	Noise
FR.052	Fall River	St. Matthews Convent	No	Yes: Moderate to severe train noise	No	Noise
FR.053	Fall River	St. Matthews School	No	Yes: Moderate to severe train noise	No	Noise

Potential Adverse Effects on Archaeological Resources along the Fall River Secondary Rail Segment

The Fall River Secondary Electric and Diesel APE includes the active freight railroad right-of-way between Myricks Junction in Taunton and Fall River, and any other work areas including electrification infrastructure that would involve earth moving outside of the previously disturbed railroad right-of-way. Appendix 4.8-C presents the assessment of potential impacts to archaeological resources (Table 4.8-13) within the Fall River Secondary portion of the Southern Triangle APE.

Table 4.8-13 Archaeological Sites Identified on the Fall River Secondary Rail Segment

Site Name	Identified Cultural Deposits	Preliminary (Approximate) Site Boundaries	NR eligibility/ recommendation	Project Alternative
Quartz Vein Site	15 chipping debris	Within right-of-way: 23-x-77 m (1771 sq. m)	NR eligible	Stoughton and Whittenton
Circling Hawk Site	46 pre-contact materials: chipping debris, 1 biface, 1 projectile point, fire-cracked rock, calcined bone, shell	Within right-of-way: 25-x-178 m (4450 sq. m)	NR eligible	Stoughton and Whittenton
Cold Toad Site	21 pre-contact materials: chipping debris, 1 biface, fire-cracked rock, hearth or cooking pit feature	Within right-of-way: 10-x-40 m (400 sq m)	NR eligible	Stoughton and Whittenton
Overlook Site North	95 pre-contact materials: chipping debris, aboriginal pottery, cut/butchered mammal bone, oyster shell	Within LOD: 15-x-65 m (975 sq m)	NR eligible	Stoughton and Whittenton
Overlook Site South	74 pre-contact materials: chipping debris, oyster and quahog shell	Within LOD: 15-x-125 m (1875 sq. m)	NR eligible	Stoughton and Whittenton
Landowner's Folly Site	3 chipping debris	Within proposed station footprint: two find spots, each 10-x-10 m (100 sq. m) (total 200 sq. m)	Not NR eligible (disturbed context)	Stoughton and Whittenton
Braley Cemetery (MHC #FRE.823)	Contains over 150 marked burials dating from the early 1800s (pre-railroad) to present-day	Three cemetery lots (two town-owned, one private); each lot measures about 0.5 acre; total 1.49 acres (modern assessor's maps); cemetery frontage right-of-way : 45 m (west); 82 m (east)	Not NR eligible; marked and unmarked burials adjacent to cut railroad embankments	Stoughton and Whittenton

A 1.6-mile-long segment of the Fall River Secondary line lies within the Lower Taunton River Basin Archaeological District in Freetown. This archaeological district contains a number of significant archaeological sites including pre-contact/contact period Native American resources and sensitive lands where undocumented sites may be present. A nineteenth-century mill complex is also adjacent to the rail right-of-way, outside of the archaeological district. The intensive (locational) survey of the Fall River Secondary right-of-way identified five pre-contact archaeological sites, all of which have been determined by the Corps, in consultation with the Massachusetts SHPO and the Aquinnah THPO, to be eligible for the National Register.

For the electric option, there is the possibility that proposed overhead catenary structure support footings could extend into archaeologically sensitive strata below rail bed disturbance and fill deposits. Specific sensitivity areas would be determined based on a review of soil borings and/or a detailed soil profile of the right-of-way using soil boring logs. The location, number and size of soil borings would be determined to minimize impacts to archeological resources as a result of field testing. An intensive (locational) survey may be needed in sensitive areas where direct physical construction impacts are planned. Archaeological surveys for track improvements including electrification infrastructure that would involve earthmoving below or outside of the previously disturbed railroad right-of-way within the APE will be completed as more detailed design information becomes available. Project impacts to archaeological resources in these portions of the Fall River Secondary Electric and Diesel APE will be assessed prior to completion of environmental review and when more detailed design information is available, as described in the draft PA (Appendix 4.8-A).

New Bedford Main Line

Existing freight track would be upgraded and the line would be double track for the entire length between Weir Junction and downtown New Bedford (which includes a portion of the Attleboro Secondary between Weir Junction and Myricks Junction), a distance of 18.51 miles. Passing sidings may also be an option instead of the double track. The section between Weir Junction and Cotley Junction would be a triple track section to allow for freight movement around a proposed station (Taunton Depot).

New catenary supports, wires, and up to three traction power facilities at specified locations would be constructed along the length of the line for the electrification option. The traction power facilities are:

- TP-07, Substation (TPSS-2) as part of the Stoughton and Whittenton Electric Alternative
- TP-09, Paralleling Station (PS-6) as part of Stoughton and Whittenton Electric Alternative

Two new train stations would be constructed in New Bedford (King's Highway and Whale's Tooth) and one new station (Taunton Depot) would be constructed in Taunton. One new layover facility would be constructed in New Bedford, at the Wamsutta location.

Potential Adverse Effects on Historic Resources along the New Bedford Main Line

The impacts of the South Coast Rail project to historic resources along the New Bedford Main Line of the Southern Triangle segment of the project may be permanent or temporary, direct or indirect. For the two options (electric and diesel), there is a combined total of 8 historic properties (Tables 4.8-14 through 4.8-16). The locations of these structures and districts along the Attleboro Secondary and New

Bedford Main Line are shown in Figures 4.8-9 through 4.8-13. Appendix 4.8-B presents the data on the individual structures and districts.

Table 4.8-14 Southern Triangle, New Bedford Main Line Affected Historic Resources

Option	Historic – Individual	Historic Districts	Figure	Appendix
Electric	4	4	Figures 4.8-9 through 4.8-13	Appendix 4.8-B
Diesel	4	4	Figures 4.8-9 through 4.8-13	Appendix 4.8-B

Direct Impacts on Historic Resources along the New Bedford Main Line Rail Segment

Project work elements and direct impacts for the New Bedford Main Line electric option will be similar to the other electric alternatives.

No National Register-listed, or determined eligible historic properties are located in the direct impact APEs for the three traction power sites proposed for the Stoughton Electric Alternative. Therefore, there will be no direct effects to historic properties at these locations.

Project work elements and direct impacts for the New Bedford Main Line diesel option are identical to the electric option, as there are no direct impacts from the electrical power infrastructure.

Indirect Impacts on Historic Resources along the New Bedford Main Line Rail Segment

Indirect impacts from the New Bedford Main Line electric option will be similar to the other electric alternatives.

The introduction of additional rail service will result in increased noise during operations from train noise and horn blowing at grade crossings. The noise increase will cause moderate to severe, or severe noise at residential, contemplative, and quiet setting historic resources at the following grade crossing locations. These specific areas and resources would likely require sound insulation or barrier mitigation:

- Padelford Street grade crossing: 1 Macomber Street, Berkley (Map No. Be.006. Figure 4.8-10)
- Malbone Street grade crossing: Malbone Street, Lakeville (Map No. La.C, Figure 4.8-11)

Similarly, moderate to severe noise from operations may be experienced for historic properties within the Acushnet Heights Historic District, New Bedford (Map No. NB.C, Figure 4.8-13). Sound insulation or barrier mitigation would likely be needed at some of the properties within the district.

New construction including stations (see Section 4.8.3.6 below), traction power facilities, catenary systems, bridge modifications and replacements, right-of-way fencing, and noise mitigation barriers changes may have indirect visual impacts on adjacent historic architectural resources and their settings. The new catenary system along the right-of-way will have a moderate to severe visual effects on all the residential, commercial, and landscape (but not on industrial or transportation) historic resources throughout the rail corridor (see list in Appendix 4.8-B, Table 1).

One traction power facility may have a visual effect on historic properties through the introduction of modern power structures that could alter the historic setting:

- TP-09, Paralleling Station (PS-6) as part of Stoughton and Whittenton Electric Alternatives on four historic properties or districts in New Bedford (Figure 4.8-13):
  - Acushnet Heights Historic District (Map No. NB.C)
  - Dawson Building (Map No. NB.065)
  - Wamsutta Mills Historic District (Map No. NB.D)

Indirect impacts for the New Bedford Main Line diesel option are similar to the electric option, with the exception of those generated by electrical catenary and traction power infrastructure (see list in Appendix 4.8-B). Therefore, the diesel option would result in less visual impact.

Table 4.8-15 and Table 4.8-16, below, summarize the adverse effects likely to result from reconstructing the New Bedford Main Line, for the electric and diesel alternatives.

Table 4.8-15 Potential Adverse Effects to Historic Resources, New Bedford Main Line (Electric Alternatives)

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
La.C	Lakeville	Assonet Cedar Swamp Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary	Noise Visual
Be.C	Berkley	Myricks Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of new catenary, and traction power facility	Noise Visual
Be.006	Berkley	Residence, 1 Macomber St	No	Yes: Severe train and horn noise	Yes: Severe, adjacent to new catenary	Noise Visual
NB.C	New Bedford	Acushnet Heights Historic District	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of new catenary and layover facility	Noise Visual
NB.D	New Bedford	Wamsutta Mills Historic District	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of new catenary and layover facility	Noise (to residential area) Visual
NB.029	New Bedford	Christ Presbyterian Church	No	No	Yes: Moderate, in vicinity of new catenary	Visual
NB.053	New Bedford	Purchase Street Fire Station	No	Yes: Moderate train noise	Yes: Moderate, in vicinity of new catenary	Visual
NB.065	New Bedford	Dawson Building	No	No	Yes: Moderate, in vicinity of new catenary and traction power facility	Visual

Table 4.8-16 Potential Adverse Effects to Historic Resources, New Bedford Main Line (Diesel Alternatives)

Map ID	Town	Resource	Direct Physical	Indirect Noise	Indirect Visual	Adverse Effects
La.C	Lakeville	Assonet Cedar Swamp Area	No	Yes: Moderate to severe train and horn noise	No	Noise
Be.C	Berkley	Myricks Street Area	No	Yes: Moderate to severe train and horn noise	Yes: Moderate to severe, portions of area are in vicinity of traction power facility	Noise Visual
Be.006	Berkley	Residence, 1 Macomber St	No	Yes: Severe train and horn noise	No	Noise
NB.C	New Bedford	Acushnet Heights Historic District	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of layover facility	Noise Visual
NB.D	New Bedford	Wamsutta Mills Historic District	No	Yes: Moderate to severe train noise	Yes: Moderate, in vicinity of layover facility	Noise (to residential area) Visual
NB.065	New Bedford	Dawson Building	No	No	Yes: Moderate, in vicinity of traction power facility	Visual

Potential Adverse Effects on Archaeological Resources along the New Bedford Main Line

The New Bedford Main Line Electric and Diesel APE includes the active freight railroad right-of-way between Weir Junction in Taunton and New Bedford, and any other work areas including electrification infrastructure that would involve earthmoving outside of the previously disturbed railroad right-of-way. Appendix 4.8-C presents the assessment of potential impacts to archaeological resources within the New Bedford Main Line portion of the Southern Triangle APE.

Two historic cemeteries are located adjacent to the New Bedford Main Line right-of-way. The cemeteries are:

- Howland Cemetery, MHC #LAK.806 in Lakeville
- Braley Cemetery, MHC #FRE.823 in Freetown

Historic research has concluded that graves are unlikely to be located within the right-of-way, but marked and unmarked interments may be immediately adjacent to the right-of-way.

For the electric option, there is the possibility that proposed overhead catenary structure support footings could extend into archaeologically sensitive strata below rail bed disturbance and fill deposits within the New Bedford Main Line right-of-way. Specific sensitivity areas would be determined based on a review of soil borings and/or a detailed soil profile of the right-of-way using soil boring logs. An intensive (locational) survey may be needed in sensitive areas where direct physical construction

impacts are planned. Project impacts to archaeological resources will be assessed prior to completion of environmental review and when more detailed design information is available, as described in the draft PA (Appendix 4.8-A).

The archaeological survey for track improvements including electrification infrastructure that would involve earthmoving below or outside of the previously disturbed railroad right-of-way within the APE will be conducted during subsequent stages of environmental review. Impacts to archaeological resources in these portions of the New Bedford Main Line Electric and Diesel APE will be assessed prior to completion of environmental review and when more detailed design information is available, as described in the draft PA (Appendix 4.8-A).

4.8.3.6 Stations

There are 12 stations proposed for new construction or improvements for the Stoughton and Whittenton Alternatives, including the Southern Triangle (electric and diesel). Station plans are conceptual at this point, consisting of general layouts and footprints within specified larger parcels. Rail stations will typically consist of a raised 800-foot long platform, canopy, parking lot, signage and lighting.

Conceptual plans were used for the data collection and analysis of cultural resources at the proposed stations. The potential impacts to identified cultural resources station concepts are presented below. The discussions below detail the results of investigations to date at the various stations. Appendix 4.8-C, Table 5 presents the assessment of potential impacts to archaeological resources within the Station APEs. Appendix 4.8-C, Table 6 presents the assessment of potential impacts to archaeological resources with the layover facility APEs. The impacts to the historic structures, areas, and districts are summarized on Appendix 4.8-B, Table 11 and discussed in text below.

Battleship Cove

The Battleship Cove Station would be a new station constructed behind the Ponte Delgada monument along Water Street on an approximately 2.2-acre parcel near the southern terminus of the Fall River Secondary. It would serve all of the rail alternatives. The station would be designed to serve walk-in customers and pick up-drop off customers with no parking. The City of Fall River constructed a pickup-drop off loop road for the future commuter rail station as part of the Ponte Delgada monument construction.

Historic Resources

The proposed Battleship Cove Station at the terminus of the Fall River Secondary is adjacent to the American Printing Company–Metacomet Mill (Map Nos. FR.N, FR.C), the American Printing Company Machine Shop (Map No. FR.088), and the Borden and Remington Company (Map No. FR.089) as shown in Figure 4.8-16. There are no historic resources on the site; therefore, there will be no direct impacts to historic resources.

The introduction of a new station may have indirect visual effects on these three historic properties through the introduction of modern station structures that alter the historic setting. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

There are no recorded archaeological sites or identified archaeologically sensitive areas within the 2.2-acre project parcel. No project impacts to archaeological resources are anticipated by the construction of this proposed station for the rail alternatives.

Canton Center

Canton Center Station is an existing station site off of Washington Street that would be modified to accommodate a second track. Two new 800-foot-long low-level platforms with mini-high platforms would be constructed (one adjacent to each track). Modifications to the tracks and platforms would require minor changes to the parking layout in the existing lots near the station, and no adjustments to the amount of existing parking spaces would be expected.

Historic Resources

Canton Center Station is not a historic resource but is adjacent to the Canton Center Area (Map No. Ca.C) as shown in Figure 4.8-2. There are no historic resources on the site; therefore, there will be no direct impacts to historic resources.

Improvements to the existing station may have indirect visual effects on Canton Center Area through the introduction of modern station structures that alter the historic setting. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

No archaeological survey has been conducted; however, the current conceptual plan indicates that the station modification work will be contained within the existing disturbed railroad right-of-way and paved station site. Therefore, no project impacts to archaeological resources are anticipated.

Dana Street Station in Downtown Taunton

The Dana Street Station would be located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton. It would only serve the Whittenton Alternatives.

Historic Resources

The Taunton State Hospital property (Map No. Ta.S), which is listed in the National Register, is located on the opposite side of Dana Street to the east. The new station may have an indirect effect on the historic architectural and setting qualities of the Taunton State Hospital; however, these are not anticipated to be substantially different from existing conditions so the effect would not be adverse. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

The Staples Coal Company (Map No. Ta.160) is located at 28 Dana Street south of the station APE. The introduction of a new station could have indirect visual effects on this historic property through the introduction of modern station structures and parking that alter the historic setting. However, the effect will not be adverse because of the existing dense urban character of the surrounding area and the original industrial/transportation related function of the historic building. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

The proposed Dana Street Station was assigned moderate sensitivity for primarily pre-contact Native American archaeological resources. A review of the 2006 soil test pit data indicates that the fill is shallow in some portions of the proposed station footprint parcel, perhaps as little as 6 inches, but does extend up to 5 feet deep in other portions of the proposed station footprint. Soil borings planned for the proposed station footprint as design advances may provide information that could be used to refine the sensitivity assessment and determine the presence and depth of sensitive strata. Sensitive areas would likely require a combination of hand and machine-assisted subsurface testing as part of an intensive (locational) archaeological survey. The intensive survey is recommended for any sensitive portions of the proposed Dana Street Station footprint that cannot be avoided during project design advances. The survey would be designed to locate any potentially significant archaeological resources that may be impacted by the project.

Easton Village

The Easton Village Station would be a new station consisting of platform, canopy, and drop-off parking lot only constructed on an approximately 1-acre parcel adjacent to Sullivan Avenue in North Easton Village along the Stoughton Line (Figure 4.8-4). It would serve the rail alternatives.

Historic Resources

The proposed Easton Village Station on the Stoughton Line in Easton (Figure 4.8-4) is located immediately adjacent to the Easton Old Colony Railroad Station (Map No. Ea.003), which is part of the H.H. Richardson Historic District NHL (Map No. Ea.D) and is within the National Register listed North Easton Historic District (Map No. Ea.B).

The proposed station site abuts important contributing properties of this district that are associated with the Ames Shovel Works. The introduction of a new station will have a direct effect on the Stoughton Line through construction of new platform and related features on the railroad embankment. The new station will have indirect visual effects on the surrounding National Register and NHL properties through the introduction of modern station structures and parking that alter the historic setting. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

The northern portion of the 1-acre project parcel is assessed as having moderate sensitivity for 1) pre-contact Native American habitation and resource procurement/processing sites; and 2) undocumented eighteenth and nineteenth-century industrial and railroad-related resources beneath the built-up railroad embankment.

An intensive (locational) archaeological survey was conducted and located one post-contact archaeological site. The site is not eligible for the National Register due to poor physical integrity and low research potential.

Fall River Depot

The Fall River Depot would be a new train station constructed on an approximately 8-acre parcel, 1 mile north of downtown Fall River at Route 79 and Davol Street along the Fall River Secondary (Figure 4.8-16). It would serve all of the rail alternatives.

Historic Resources

There are no historic resources on the site of the proposed Fall River Depot Station on the Fall River Secondary. Therefore, there will be no direct impacts to historic resources

The proposed Station is located across the rail right-of-way from the Pearce-Durfee Street Area (Map No. FR.L). This historic property has been determined eligible for inclusion in the National Register. The introduction of a new station will have indirect visual effects on this historic property through the introduction of modern station structures and parking that could alter the historic setting. However, the effect would not be adverse due to the industrial character of the adjacent part of the Pearce-Durfee Street Area and the presence of the highway. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

There are no recorded archaeological sites or identified archaeologically sensitive areas within the 8-acre project parcel. No project impacts to archaeological resources are anticipated by the construction of this proposed station.

Freetown

The Freetown Station would be a new train station constructed on an 18-acre parcel situated on South Main Street and west of the Fall River Secondary right-of-way (Figure 4.8-15). The parcel currently contains a self-storage business, and is near the Fall River Executive Park and the proposed Riverfront Park. It would serve all of the rail alternatives.

Historic Resources

The Freetown Station does not have any historic resources on the proposed site or within the APE. Therefore, there would be no impacts to historic resources.

Archaeological Resources

The proposed Freetown Station lies within the Lower Taunton River Basin Archaeological District. The 18-acre project parcel contains areas of moderate and high archaeological sensitivity for pre-contact Native American habitation and resource procurement/processing sites. However, the site has been largely disturbed by land clearing and scraping/stockpiling of soils which compromised its integrity well in advance of this commuter rail proposal.

An intensive (locational) archaeological survey was conducted and located one pre-contact archaeological site, the Landowner's Folly Site. The site is not eligible for the National Register due to poor physical integrity and low research potential.

King's Highway

The King's Highway Station would be a new train station constructed on a 55-acre parcel within a dense commercial strip off of King's Highway in New Bedford east of Route 140 along the New Bedford Main Line (Figure 4.8-13). The new station would occupy part of a site that is an existing shopping plaza. It would serve all of the rail alternatives.

Historic Resources

The King's Highway Station does not have any historic resources on the proposed site or within the APE. There will be no impacts to historic resources.

Archaeological Resources

The 55-acre project parcel contains areas of moderate archaeological sensitivity for pre-contact Native American habitation and resource procurement/processing sites. In addition, buildings are documented as present between 1895 and 1911. Though these buildings have been razed, undocumented archaeological deposits related to this period of site use may be present in the north part of the parcel.

The current conceptual plan indicates that the proposed work will be contained within the existing disturbed railroad right-of-way and paved shopping plaza in areas assigned low archaeological sensitivity. No project impacts to archaeological resources are anticipated in these previously disturbed areas.

North Easton

The North Easton Station (Figure 4.8-3) would be a new train station constructed on an approximately 10-acre parcel. The parcel lies behind an existing retail plaza anchored by Roche Brothers shopping plaza along the Stoughton line. New medical buildings have been recently constructed and two additional buildings are planned. The station would serve the rail alternatives.

Historic Resources

North Easton Station does not have any historic properties on the proposed site or within the APE. There would be no impacts to historic resources.

Archaeological Resources

The 10-acre project parcel contained an area of moderate archaeological sensitivity for pre-contact Native American habitation and resource procurement/processing sites as well as under-documented post-contact EuroAmerican sites.

An intensive (locational) archaeological survey was conducted and located one post-contact sheet refuse deposit. This deposit is not eligible for the National Register due to fair physical integrity and low research potential.

Raynham Park

The Raynham Park Station would be located at the former Raynham-Taunton Greyhound Park off of Route 138 (Figure 4.8-5). The new station would be constructed on a less than 5-acre parcel along the Stoughton line. The station would serve the Stoughton Alternatives including the Whittenton variations.

Historic Resources

No historic properties are located on the Raynham Park Station parcel nor do any exist within the station APE. There will be no impacts to historic resources.

Archaeological Resources

There are no recorded archaeological sites or identified archaeologically sensitive areas within the Raynham Park Station parcel. The station is within the rail APE and has been subjected to prior disturbance. No project impacts to archaeological resources are anticipated by the construction of this proposed station.

Stoughton (Existing Station)

The Stoughton Station is an existing commuter rail station located off of Route 138 near Stoughton Center along the Stoughton line (Figure 4.8-3). The existing Stoughton Station would be relocated to accommodate a second track and the existing station would be decommissioned. Modifications to the station property may need to be made necessary to ensure safety.

Historic Resources

The existing station (Stoughton Station; Map No. St.025) is an individual historic property and is within the Downtown Stoughton Area (Map No. St.B). The Mystic Rubber Company (Map No. St.024) is within the station APE.

The Meade Rubber Company (Map No. St.046) will be demolished under the current plan. Modifications necessary to accommodate a second track and decommissioning of the station may have an indirect effect on the historic architectural qualities of the station, the Area, and the Mystic Rubber Company.

Archaeological Resources

No archaeological survey has been completed at the station. The current conceptual plan indicates that the proposed work will be contained within the existing disturbed railroad right-of-way and paved station site. If the work is confined to existing built elements, no archaeological survey is warranted. No project impacts to archaeological resources are anticipated under the proposed conceptual plan.

Stoughton (New Station)

A new station would be constructed in Stoughton south of the existing station location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing. Two new 800-foot long, full-length high-level platforms would be constructed (one adjacent to each track) at the new station site. A pedestrian bridge with stairs and ramps would connect the two platforms. These modifications to the tracks and platforms would require a new parking layout to the west of the platforms. This station would continue to serve walk-in, bike-in and drive-in customers. It would serve all of the rail alternatives.

Historic Resources

The proposed relocated Stoughton Station is not within any National Register Historic District or Area, and is south of the Downtown Stoughton Area (eligible for listing). The site contains one property which is eligible for listing in the National Register: the Meade Rubber Company Building (Map No. St 046) at 25 Brock Street. The Meade Rubber Company Building is eligible for National Register listing for its associations with the locally significant rubber industry as an intact example of an early 20th century industrial loft. The proposed relocated station would require that this building be demolished, resulting in an adverse effect.

Archaeological Resources

The proposed relocated Stoughton Station project area including the realigned tracks was assigned moderate sensitivity for pre-contact Native American and nineteenth-early twentieth century post-contact period archaeological resources. The potential post-contact period archaeological resources are associated in part with the Meade Rubber Company property, eligible for listing in the National Register, and which would be demolished to accommodate the relocated station footprint. Soil borings planned for the proposed station footprint and track realignment as design advances may provide information that could be used to refine the sensitivity assessment and determine the presence and depth of sensitive strata. Sensitive areas would likely require a combination of hand and machine-assisted subsurface testing as part of an intensive (locational) archaeological survey. The intensive survey is recommended for any sensitive portions of the proposed relocated Stoughton Station footprint and realigned tracks that cannot be avoided during project design advances. The survey would be designed to locate any potentially significant pre-contact and post-contact archaeological resources that may be impacted by the project.

Taunton (Dean Street)

The Taunton Station (Dean Street) would be a new train station constructed on an 8-acre parcel. The parcel is located off of Railroad Avenue near the intersection of Route 44 (Dean Street) and Arlington Street in Taunton along the Stoughton line (Figure 4.8-6). The station would only serve the Stoughton Alternatives.

Historic Resources

There are no historic properties on the Taunton Station parcel. Therefore, there will be no direct impacts to historic resources.

The station parcel is adjacent to the Taunton Center Area (Ta.B) and the Old Colony Railroad Station (Map No. Ta.019). Introduction of a new station may have indirect visual effects on these two historic properties through the introduction of modern station structures and parking that alter the historic setting. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

There are no recorded archaeological sites or identified archaeologically sensitive areas within the 8-acre project parcel. No project impacts to archaeological resources are anticipated by the construction of this proposed station.

Taunton Depot

The new Taunton Depot (formerly called East Taunton (North) Station) train station would be constructed on an approximately 14-acre parcel. The parcel is located off of Route 140 at the rear of an existing Target and Home Depot shopping plaza on the New Bedford Main Line (Figure 4.8-9). The station would serve all the rail alternatives.

Historic Resources

No historic properties are located on the proposed site of the Taunton Depot Station. Therefore, there will be no direct effects to historic properties.

The historic Hart Street Area (Map No. Ta.L) is in the station APE as shown in Figure 4.8-8. The introduction of a new station would not affect the visual environment. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

The current conceptual plan indicates that the proposed work will be contained within the existing disturbed (southern) portion of the parcel behind the shopping plaza. This part of the parcel is assigned low archaeological sensitivity. No project impacts to archaeological resources are anticipated.

There is one recorded pre-contact archaeological site (19-BR-592) within the northern part of the 14-acre project parcel. The approximate 5-acre area containing the recorded archaeological site is assessed as having high sensitivity for potentially significant cultural deposits. The current conceptual plan indicates that no work in or use of this part of the parcel is proposed and therefore, no project impacts to archaeological resources would be anticipated.

Whale's Tooth

The Whale's Tooth Station would be a new train station. The station will be constructed on an 8.7-acre parcel off of Acushnet Avenue, east of Route 18 along the New Bedford Main Line (Figure 4.8-13) and service all of the rail alternatives.

The parcel is a paved parking lot constructed by the City of New Bedford in anticipation of the commuter rail project. The parking lot caps a closed superfund site.

Historic Resources

The parcel that will be used for the Whale's Tooth Station does not have any historic properties on it. There will be no direct impacts to historic resources.

The proposed Whale's Tooth Station on the New Bedford Main Line is across John F. Kennedy Highway (Route 18) from the New Bedford Textile School (Map No. NB.069). The introduction of a new station may have indirect visual effects on the New Bedford Textile School; however, due to the intervening highway, the effect will not be adverse. Noise, vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

The entire 8.7-acre project parcel lies within the Acushnet Avenue Waterfront Industrial historic area. This location is assessed as having a high archaeological sensitivity for pre-contact Native American habitation and resource procurement/processing sites, and documented nineteenth-century industrial and commercial sites. The archaeologically sensitive strata, if present, would be located below the raised and capped paved parking lot and the capped Superfund site soils. The current conceptual plan indicates that the proposed work will be contained within the existing disturbed railroad right-of-way and the existing Whale's Tooth paved parking lot. No project impacts to archaeological resources are anticipated.

4.8.3.7 Layover Facilities

Two train layover facilities are planned for the Southern Triangle; one each at or near the end of the Fall River Secondary (Weaver's Cove) and the New Bedford Main (Wamsutta East) Lines. Train layover facility plans are conceptual at this point, consisting only of general layouts and footprints within specified larger parcels. Current, refined conceptual plans for these facilities may be slightly different, and were also reviewed for potential impacts to archaeological resources.

Wamsutta

The Wamsutta site overnight layover facility would be constructed on an approximately 8-acre parcel between Route 18 and Herman Melville Boulevard along the New Bedford Main Line (Figure 4.8-13). It is located on the east side of the right-of-way, opposite the proposed Whale's Tooth Station and adjacent to an existing CSX freight yard. The layover facility would serve all of the rail alternatives.

Historic Resources

The Wamsutta Street Layover Facility does not have any historic properties on the proposed site; therefore, there will be no direct impacts to historic resources.

The Wamsutta Layover Facility is located on the east side of the New Bedford Main Line rail between Wamsutta Street and the proposed Whale's Tooth Station. The Wamsutta Mill Historic District (Map No. NB.D) and the Revere Copper Products mill (Map No. NB.080) are both located within the APE as shown in Figure 4.8-13. The introduction of a layover facility could have indirect visual and noise effects on the two nearby historic properties. Because the site is adjacent to the existing freight yard and will constitute an expansion of similar rail use, the visual impacts to the historic setting is likely to not be adverse. There will be no noise impacts to the adjacent historic industrial buildings, which are not a category of noise sensitive receptors under the FTA criteria. Vibration, traffic, atmospheric, and cumulative effects are anticipated to be minimal.

Archaeological Resources

The entire 8-acre project parcel is assessed as having a high archaeological sensitivity for pre-contact Native American habitation, resource procurement/processing sites, and documented post-contact Euro-American domestic, commercial/wharves, and railroad-related structures. This also includes cultural deposits within the Acushnet Avenue Waterfront Industrial historic area. The archaeologically sensitive strata are located below the capped Superfund site soils.

The current conceptual plan indicates that the proposed work will be contained within the existing disturbed railroad right-of-way/rail yard and capped Superfund site soils. Therefore, no project impacts to archaeological resources are anticipated.

Weaver's Cove East

The Weaver's Cove East site layover facility would be constructed on the east side of the railroad right-of-way, opposite the proposed Weaver's Cove LNG Site, approximately 2.5 miles from the southern terminus of the Fall River Secondary (Figure 4.8-16). The layover facility would serve all of the rail alternatives. A parcel on the west side of the railroad right-of-way within the proposed Weaver's Cove LNG Site is also being considered.

Historic Resources

The historic survey completed for the Weaver's Cove layover facility parcel on the west side of the railroad right-of-way encompasses the historic resources in the APE of the current site on the east side of the right-of-way (see Figure 4.8-16). Based on the survey completed for the west site, the Weaver's Cove East site overlaps into a portion of the North Main Street Area (Map No. FR.D) that is eligible for the National Register. This part of the area has no buildings. The construction of the layover facility would be an adverse effect as it would change the visual setting and the character of the area.

Two historic properties are located in the layover facility APE: the National Register-listed Squire William B. Canedy House (Map No. FR.012) and the National Register-eligible William J. Wiley Middle School (Map No. FR.013).

The William B. Canedy House would be separated from the layover facility by a modern building and outbuildings, and then by the tracks. There would be no adverse visual impact because the layover facility would not substantially alter the historic setting of the house, which is already converted to industrial uses (i.e. the tank farm). There would be no noise impacts that would require modifications to the building and no land acquisition from the property.

The William J. Wiley Middle School is located on the opposite (east) side of Main Street from the facility and separated from it by this major roadway and several modern buildings. There would be no property acquisition, no change in the setting of the school, and no noise impacts that would require modifications to the exterior of the building.

There will be no adverse effect to the nearby National Register-listed Squire William B. Canedy House and the National Register-eligible William J. Wiley Middle School.

Archaeological Resources

The project parcel on the west side of the railroad right-of-way within the proposed Weaver's Cove LNG Site was previously subjected to an archaeological reconnaissance survey in 2003. No areas of archaeological sensitivity were identified in the previously disturbed parcel, and no further work was deemed necessary.

The project parcel on the east side of the railroad right-of-way opposite the Weaver's Cove LNG Site has not been subjected to archaeological reconnaissance survey. An archaeological reconnaissance survey is needed to assess the archaeological sensitivity of this parcel. An intensive (locational) survey may be needed to identify archaeological sites in sensitive areas. Project impacts to archaeological resources for the Weaver's Cove East parcel will be assessed when more design information is available, as described in the PA (Appendix 4.8-A).

4.8.4 Summary of Impacts by Alternative

The following summarizes the potential impacts (direct, indirect, permanent, and temporary) to cultural resources resulting from implementing each of the South Coast Rail alternatives.

The individual components of each element are grouped by alternative, and the expected impacts to historic and archaeological resources are summarized based on a quantitative assessment of the impact on cultural resources that would result from the construction of each component.

4.8.4.1 Stoughton Electric Alternative

The Stoughton Electric Alternative would be comprised of the elements listed in Table 4.8-17, which also includes summaries of the identified known/expected resource types and potential impact(s) from implementing this alternative.

The Stoughton Electric Alternative would result in direct impacts (adverse effects) to five historic properties. In addition, this alternative would have indirect effects to an additional 60 properties as a result of changes in setting and/or increased noise that could affect the setting directly or require noise mitigation that could affect the appearance or setting of a building. It could affect ten archaeological sites for reconstruction of the Stoughton Line and Fall River Secondary. These ten archaeological sites are eligible for the National Register.

Table 4.8-17 Stoughton Electric Alternative–Summary of Impacts

	Historic Resources				National Register–Eligible Archaeological Sites
		Indirect			
Element	Direct	Visual	Noise	Noise + Visual	
Railroad Alignments					
Stoughton Line	3	11	0	16	5
Attleboro Secondary	0	1	0	2	0
Fall River Secondary	1	7	0	12	5
New Bedford Main	0	3	0	5	0
Stations					
Canton Center	0	0	0	0	0
Stoughton	1	1	0	0	0
North Easton	0	0	0	0	0
Easton Village	0	1	0	0	0
Raynham Park	0	0	0	0	0
Taunton Depot	0	0	0	0	0
Freetown	0	0	0	0	0
Fall River Depot	0	0	0	0	0
Battleship Cove	0	0	0	0	0
King's Highway	0	0	0	0	0
Whale's Tooth	0	0	0	0	0
Layover Facilities					
Wamsutta	0	0	0	0	0
Weaver's Cove East	0	1	0	0	0
Totals	5	25	0	35	10

4.8.4.2 Stoughton Diesel Alternative

The Stoughton Diesel Alternative would be comprised of the same elements as the Stoughton Electric Alternative as listed above but would not include electrical infrastructure. Specifically, the metal structures and wires associated with the overhead catenary system, and the traction power facilities would not be constructed as part of this alternative (except along the Northeast Corridor, as previously

explained). Table 4.8-18 summarizes the impacts to cultural resources potentially resulting from implementing the Stoughton Diesel Alternative.

The Stoughton Diesel Alternative would result in direct impacts (adverse effects) to six historic properties, primarily historic bridges that would require reconstruction or widening, and potential direct impacts at some existing stations that would need to be reconstructed. In addition, this alternative would have indirect effects to an additional 44 properties as a result of changes in setting and/or increased noise that could affect the setting directly or require noise mitigation that could affect the appearance or setting of a building. It could affect ten archaeological sites for reconstruction of the Stoughton Line and Fall River Secondary. These ten archaeological sites are eligible for the National Register.

Table 4.8-18 Stoughton Diesel Alternative–Summary of Impacts

		Historic Resources			National Register–Eligible Archaeological Sites
		Indirect			
Element	Direct	Visual	Noise	Noise + Visual	
Railroad Alignments					
Stoughton Line	3	5	5	11	5
Attleboro Secondary	0	0	1	2	0
Fall River Secondary	1	1	8	3	5
New Bedford Main	0	1	2	3	0
Stations					
Canton Center	0	0	0	0	0
Stoughton	1	1	0	0	0
North Easton	0	0	0	0	0
Easton Village	0	1	0	0	0
Raynham Park	0	0	0	0	0
Taunton Depot	0	0	0	0	0
Freetown	0	0	0	0	0
Fall River Depot	0	0	0	0	0
Battleship Cove	0	0	0	0	0
King’s Highway	0	0	0	0	0
Whale’s Tooth	0	0	0	0	0
Layover Facilities					
Wamsutta	0	0	0	0	0
Weaver’s Cove East	0	0	0	0	0
Totals	5	9	16	19	10

4.8.4.3 Whittenton Electric Alternative

The Whittenton Electric Alternative, as a variation of the Stoughton Electric Alternative, would be comprised of the elements listed in Table 4.8-19, which also include summaries of the identified known/expected resource types and potential impact(s) from implementing this alternative. The Whittenton Electric Alternative would result in direct impacts (adverse effects) to five historic properties. In addition, this alternative would have indirect effects to an additional 65 properties as a

result of changes in setting and/or increased noise that could affect the setting directly or require noise mitigation that could affect the appearance or setting of a building. It could affect eleven archaeological sites that have been determined eligible for the National Register.

Table 4.8-19 Whittenton Electric Alternative–Summary of Impacts

Element	Direct	Historic Resources – Indirect: Visual	Historic Resources – Indirect: Noise	Historic Resources – Indirect: Noise + Visual	National-Register Eligible Archaeological Sites
Railroad Alignments					
Stoughton Line	3	10	0	4	2
Whittenton Branch	0	0	0	4	4
Attleboro Secondary	0	8	0	8	0
Fall River Secondary	1	7	0	12	5
New Bedford Main	0	3	0	5	0
Stations					
Canton Center	0	0	0	0	0
Stoughton	1	1	0	0	0
North Easton	0	0	0	0	0
Easton Village	0	1	0	0	0
Raynham Park	0	0	0	0	0
Dana Street	0	2	0	0	0
Taunton Depot	0	0	0	0	0
Freetown	0	0	0	0	0
Fall River Depot	0	0	0	0	0
Battleship Cove	0	0	0	0	0
King's Highway	0	0	0	0	0
Whale's Tooth	0	0	0	0	0
Layover Facilities					
Wamsutta	0	0	0	0	0
Weaver's Cove East	0	0	0	0	0
Totals	5	32	0	33	11

4.8.4.4 Whittenton Diesel Alternative

The Whittenton Diesel Alternative would be comprised of the same elements as the Whittenton Electric Alternative as listed above but would not include electrical infrastructure. Specifically, the metal structures and wires associated with the overhead catenary system, and the traction power facilities would not be constructed as part of this alternative (except along the Northeast Corridor, as previously explained). Table 4.8-20 summarizes the impacts to cultural resources potentially resulting from implementing the Whittenton Diesel Alternative.

The Whittenton Diesel Alternative would result in direct impacts (adverse effects) to five historic properties. In addition, this alternative would have indirect effects to an additional 44 properties as a result of changes in setting and/or increased noise that could affect the setting directly or require noise

mitigation that could affect the appearance or setting of a building. It could affect two known archaeological sites for reconstruction of the Fall River Secondary. It could affect eleven archaeological sites that have been determined eligible for the National Register.

Table 4.8-20 Whittenton Diesel Alternative–Summary of Impacts

	Historic Resources				National – Register Eligible Archaeological Sites
		Indirect			
Element	Direct	Visual (only)	Noise (only)	Noise + Visual	
Railroad Alignments					
Stoughton Line	3	3	1	7	2
Whittenton Branch	0	0	0	2	4
Attleboro Secondary	0	2	3	4	0
Fall River Secondary	1	1	8	3	5
New Bedford Main	0	1	2	3	0
Stations					
Canton Center	0	0	0	0	0
Stoughton	1	1	0	0	0
North Easton	0	0	0	0	0
Easton Village	0	1	0	0	0
Raynham Park	0	0	0	0	0
Dana Street	0	2	0	0	0
Taunton Depot	0	0	0	0	0
Freetown	0	0	0	0	0
Fall River Depot	0	0	0	0	0
Battleship Cove	0	0	0	0	0
King's Highway	0	0	0	0	0
Whale's Tooth	0	0	0	0	0
Layover Facilities					
Wamsutta	0	0	0	0	0
Weaver's Cove East	0	0	0	0	0
Totals	5	11	14	19	11

4.8.4.5 Summary of Impacts

The overall impacts to historic and archaeological resources resulting from improving or constructing the rail alternatives vary considerably between the alternative alignments (Table 4.8-21). Each of the alternatives would be similar in their adverse effects to historic structures. The majority of these direct effects, for all alternatives, would result from reconstructing historic bridges to accommodate an additional track, or to meet Federal Railroad Administration loading standards for commuter rail trains. Each of the alternatives would also result in indirect impacts to historic properties as a result in the change in setting (visual impacts) or increased noise (which could affect quiet setting or could result in noise mitigation that would alter the appearance or setting of a structure). These indirect effects (only visual, only noise, or a combination of the two) would impact the largest number of properties (72) for the Whittenton Electric Alternative.

Each of the alternatives would also have the potential to affect as yet to be determined archaeological resources and areas of archaeological sensitivity (which would require further investigation to determine if archaeological resources were present). There may also be the potential that traditional cultural properties may be affected. Should such potential exist, this would be resolved through dialogue with the federally-recognized Indian Tribes known to have an interest in impacts to traditional cultural properties located within upon their historical aboriginal lands.

Table 4.8-21 Summary of Potential Impacts to Historic and Archaeological Resources

Alternative	Historic Resources Direct	Indirect Visual	Indirect Noise	Indirect Noise + Visual	National Register-Eligible Archaeological Sites
Stoughton Electric	5	25	0	27	10*
Stoughton Diesel	5	9	19	19	10
Whittenton Electric	5	32	0	33	11*
Whittenton Diesel	5	11	14	19	11

*Impacts are contingent upon the results of additional cultural resource investigations that may be necessary for electrification infrastructure.

4.8.5 Mitigation

This section summarizes the mitigation measures that may be considered to avoid, minimize, or mitigate the potential impacts on historic and archaeological resources resulting from the implementation of the South Coast Rail project alternatives. The specific mitigation will be informed by additional design detail.

Cultural resources are defined as archaeological sites; historic buildings, structures, objects, and districts; and traditional cultural properties including both individual sites and landscapes. Consultation has been initiated with federally recognized Indian Tribes; however, no written information has been received to date and traditional cultural properties are not considered in the discussions below. The discussion below considers the regulatory requirements of the National Environmental Policy Act (NEPA), §106 of the National Historic Preservation Act (NHPA), and regulatory guidance detailed in National Register Bulletin 45, *Guidelines for Evaluating and Registering Archaeological Properties* (Little et al. 2000).

Assessment of impact to cultural resources was based on the Corps' methodology as described in Appendix C - Procedures for the Protection of Historic Properties[4] of 33 CFR Part 325 - Processing of Department of the Army Permits (Appendix C). Appendix C identifies the procedures to be followed by the Corps to fulfill the requirements set forth in the National Historic Preservation Act (NHPA), other applicable historic preservation laws, and Presidential directives as they relate to the regulatory program of the Corps of Engineers (33 CFR Parts 320-334).

The central concept in the Corps methodology is the "Permit Area," as defined in Appendix C. The term "permit area" as used in Appendix C means those areas comprising the waters of the United States that will be directly affected by the proposed work or structures and uplands directly affected as a result of

[4] AUTHORITY: 33 U.S.C. 401 et seq., 33 U.S.C. 1344, 33 U.S.C. 1413.

authorizing the work or structures. The following three tests must all be satisfied for an activity undertaken outside the waters of the United States to be included within the "permit area":

- Such activity would not occur but for the authorization of the work or structures within the waters of the United States;
- Such activity must be integrally related to the work or structures to be authorized within waters of the United States. Or, conversely, the work or structures to be authorized must be essential to the completeness of the overall project or program; and,
- Such activity must be directly associated (first order impact) with the work or structures to be authorized.

The District Engineer takes into account the effects, if any, of proposed undertakings on historic properties both within and beyond the waters of the U.S. pursuant to Section 110(f) of the NHPA. The District Engineer, where the undertaking that is the subject of a permit action may directly and adversely affect any National Historic Landmark, conditions (to the maximum extent possible) any issued permit as may be necessary to minimize harm to such landmark.

In addition to Appendix C, impacts were also evaluated in accordance with the Advisory Council on Historic Preservation's regulations implementing §106 of the National Historic Preservation Act (36 CFR Part 800, *Protection of Historic Properties*), which are used by the Corps and Cooperating Agencies (FTA, FRA, FHWA and EPA). Accordingly, impacts to cultural resources are identified and evaluated by (1) determining the APE; (2) identifying cultural resources present in the APE that are either listed in or eligible to be listed in the National Register; (3) applying the criteria of adverse effect to affected eligible cultural resources; and (4) identifying ways to avoid, minimize or mitigate adverse effects as outlined in 36 CFR 800.6 (Resolution of Adverse Effects).

In addition to the requirements of the NHPA, all historic properties are subject to consideration under the National Environmental Policy Act (33 CFR Part 325, Appendix B), and the Corps' public interest review requirements contained in 33 CFR 320.4.

Mitigation measures include avoidance, minimization, data recovery, photographic recordation and treatment plans and these measures are discussed below. The documentation for any of these mitigation measures must provide evidence that consultation has been completed with the SHPO, concerned Indian Tribes and individuals with knowledge of affected resources. Further, mitigation measures must consider the comments of these persons on the measure(s) under consideration. Actions that the parties agree upon to resolve adverse effects will then be detailed in a Memorandum of Agreement (MOA) or PA, which is a legally binding agreement among the federal agency, the SHPO and/or Tribal Historic Preservation Officer(s), and the Advisory Council on Historic Preservation. The other consulting parties may also be invited to sign the document. Once the agreement is signed by all appropriate parties and the agreement is filed with the Advisory Council on Historic Preservation, the Section 106 process is completed. The agency's Section 106 responsibilities are fulfilled when the agreement's stipulations are implemented.

4.8.5.1 Avoidance

Avoidance is the preferred response when adverse effect is determined. Adverse effects can only be avoided for the No-Build Alternative, which does not meet the project purpose. Neither of the Build

Alternatives can avoid direct impacts to archaeological and above-ground resources. Impact to archaeological sites can be avoided through burial of the resource although this option has limited applicability. Avoiding indirect impacts resulting from noise and visual intrusions may be addressed for historic resources through design modification in some locations.

4.8.5.2 Minimization

Minimization of impact to historic properties or archaeological resources would be focused on reducing the extent of ground disturbance, establishing vegetated buffers, and designing noise barriers and sound insulation to be compatible with the historic setting.

The Adverse Effects documentation for an individual archaeological site, historic property, or district has to describe the option(s) selected to minimize impact. The Adverse Effect document also has to contain a discussion about the direct/indirect effects of the option on other archaeological sites, districts, and/or historic properties in the option's APE. In all cases, the archaeologists and historians will have to clearly document the horizontal and vertical boundaries of the archaeological site, historic property, or district in question as part of the Adverse Effects documentation.

4.8.5.3 Mitigation

The proposed project likely would result in unavoidable impacts to significant cultural resources that cannot be addressed through avoidance or minimization. Mitigation through data recovery and other approaches discussed below may include more than one action. The Adverse Effects documents prepared in support of the PA will outline the mitigation approaches that will be taken for each historic property. The Adverse Effects documents are commonly referred to as Data Recovery Plans (DRP) for archaeology and Treatment Plans for above-ground historic properties. The plans would be developed after the LEDPA is determined and all stages of intensive (locational) survey and, as needed, evaluative testing are completed and the results of the investigations evaluated by the applicable review agencies.

Specific mitigation commitments for cultural resources will be informed by additional, more detailed archeological and historic survey fieldwork and additional design detail for the preferred alternative and consultation with the tribes in the case of traditional cultural properties. In general, the types of mitigation measures that will be considered for above-ground historic resources include engineering methods that reduce noise generation or vibration, and visual barriers that help to minimize aesthetic impacts. For unavoidable adverse impacts, mitigation through data recovery, treatment plans, archival photographic documentation, architectural and barrier sound insulation or other approaches will be considered.

Historic Resources

Mitigation responses for historic resources are often impact specific. Table 4.8-22 lists the mitigation approaches that might be used to mitigate adverse effects resulting from specific project actions. As will be noted, these various mitigation options are directed to maintaining the historic character of both buildings and settings and maintaining the integrity of existing buildings.

Impacts to above-ground resources may be successfully reduced or eliminated by incorporating specific engineering methods that reduce noise generation or vibration, and through use of visual barriers that help to minimize aesthetic impacts. The following sections describe mitigation measures designed to avoid impacts to above-ground resources.

Table 4.8-22 Historic Properties Mitigation Approaches

Project Action	Mitigation Response
General (applicable to multiple actions)	Historic archival documentation
	Interpretive signs
Construction	Preconstruction inspection of building foundations and construction monitoring of building foundations
	Site specific design to be compatible with historic character in and adjacent to historic properties including districts and NHLs
Noise (including Vibration)	Preconstruction noise monitoring and early construction monitoring for impacts to specific resources with natural quiet as an element of setting
	Insulation
	Noise walls
	During construction, rubber ballast mats (or equivalent) or moveable point frog turnouts (or equivalent)
Traffic/Access	Sensitive design of access changes and turnarounds
	Traffic calming (particular to Easton)
Visual	Vegetation: minimize clearing within or adjacent to historic properties; use screen planting and landscaping to lessen visual impacts
	Lighting: within and adjacent to historic properties, minimize number of poles, paint poles non-contrast colors, use directed lights
	Built elements: use non-contrast paints on fence, roadway equipment, signal bungalows; locate signs and fixtures in a sensitive manner within and adjacent to historic properties
	Granite curbing: match roadway and sidewalk curbing to existing, granite curbing

Vibration Dampening

Vibration dampening can be an effective means or reducing or eliminating potential impacts to structures adjacent to active rail lines. Vibration dampening may be achieved by use of subgrade and ballast materials selected for reduced transmissions of vibration. Existing rail beds will be replaced with materials meeting the MBTA's standards for vibration transmission. If additional ballast treatment is necessary to avoid adverse impacts, ballast mats may be used. Ballast mats are a layer of rubber placed between the track and ballast to further reduce vibration. All bridges along the rail corridor will be reconstructed to include the use of ballasted decks containing a layer of crushed stone to absorb vibration and reduce noise generation. Specific mitigation measures used along the project corridor will be selected based on final design and the results of the historic properties impact assessment, as described in the PA (Appendix 4.8-A).

Noise Barriers

Noise barriers are an effective means of reducing the potential impacts created by new and expanded transportation corridors. In cases where trains may be passing close to historic structures or districts, this engineering solution may provide a means to reduce potential impacts from increased noise.

Visual Screening

The project has the potential to alter the settings of certain historic resources and historic districts where new stations, parking or at-grade crossings are proposed. While the original construction of the

Old Colony Railroad in the 1840s may have "fit in" with the aesthetic nature of the communities, the reactivation of the rail line using modern materials and safety standards and faster engines and larger passenger cars may result in undesirable changes in the visual environment. Screening certain structures and safety and signal equipment may mitigate these impacts. Potential screening techniques include the combination of wooden and opaque fencing with landscape plantings.

Unnecessary clear-cutting of trees and vegetation along the railroad right-of-way that could have an adverse visual impact on historic resources will be avoided and existing trees and vegetative screening will be retained to buffer visually historic properties from the rail line to the extent feasible and with due regard for public safety, operational requirements, cost, and maintenance considerations.

Project plans will include internal landscaped areas at station parking lots which are located within or which are visible from historic resources. In an adjacent to historic districts or individual resources, equipment including traffic signals and controller cabinets, street lights, street furniture, and railroad signal equipment housings will be dark colored to reduce the visual impact of this equipment. Traffic signals and street lights will be ornamental type in accordance with the towns' preferences to the extent reasonably possible.

These methods, when used in combination with other mitigation measures such as noise barriers, may successfully reduce and mitigate some potential visual impacts to historic properties associated with the South Coast Rail project.

Use of Compatible Materials within Historic Districts

To the extent practicable, the project will use materials compatible in color, texture and form to minimize adverse visual impacts to historic structures and districts.

A review of current conditions and materials will be undertaken prior to completion of environmental review and when more design information is available in order to ensure the use of compatible materials in the vicinity of historic properties. All repair, rehabilitation, or modification of historic properties, including sound insulation treatments for mitigation of noise impacts, will be performed in accordance with the U.S. Secretary of the Interior's "Standards for the Treatment of Historic Properties, including Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings."

Construction Staging and Methods

Construction staging and storage areas shall be located in protected areas outside historic districts and resources wherever possible, and in as unobtrusive a location as possible within historic districts or resources if alternative locations are infeasible. Where historic resources used as residences are within 50 feet of a staging area, a temporary solid wood fence, 6 feet high, will be used a visual screen between the residence(s) and the staging area.

Archaeological Resources

Impacts to archaeological resources will occur when archaeological sites are disturbed during construction. The South Coast Rail alternatives have been designed to minimize potential impacts to below-ground resources by maximizing reuse of the existing rail bed and right-of-way.

Unavoidable impacts to archaeological resources will be identified by further analysis of specific construction sites and appropriate, avoidance, minimization or mitigation selected during the Section

106 consultation process. Where impacts to archaeological resources are unavoidable, MassDOT will proceed with subsequent detailed site investigations and/or data recovery as may be stipulated in the PA developed for this project.

The mitigation approaches for archaeological sites tend to focus on data recovery: the acquisition of additional site-specific data usually consisting of more feature information and/or artifacts. There are other alternatives, referred to as Creative or Alternative Mitigation Strategies that can be explored once the impacts to archaeological sites are known. Such creative approaches may include oral histories (for historical archaeological sites), whole site excavation, laboratory work to the exclusion of additional excavation, and non-traditional reporting. Data recovery and these other options are briefly explored below.

Data recovery usually involves block excavations or the complete excavation of specific features such as privies or wells. These excavations are designed to augment and expand upon prior work to reach a cumulative percentage of site area ranging from five to ten percent. Except in certain instances, the only area of the site that will be subjected to data recovery excavation is that within the direct impact area.

The other alternatives that will be considered are non-excavation strategies and some of these may actually be used in tandem with excavation. For historical archaeological sites, the acquisition of information about site function through oral histories is particularly effective for sites that may represent particular industrial or commercial enterprises, or that represent the homes of persons from particular religious or cultural backgrounds. Laboratory analyses of particular artifact types or artifact collections have also been used as an alternative mitigation measure to additional excavation. This has been particularly effective when large collections of artifacts acquired by avocational archaeologists are available for analysis by professionals. Finally, the use of non-traditional reporting is proving to be exceptionally welcome by the public and a critical deliverable in all data recovery efforts. Non-traditional reporting includes, for example, educational web sites; the creation of teaching plans and supporting materials; video/DVD production showing the range and types of cultural resources in areas or other appropriate stories; and the production of popular books, pamphlets, or brochures for use in public outreach.

4.8.6 Regulatory Compliance

This section outlines the regulatory compliance requirements for cultural resources. These resources are regulated at the federal and state levels, and are always considered in NEPA and MEPA analyses. At the federal level, Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800) provides the regulatory framework for the compliance guidelines for the identification and evaluation of cultural resources. At the state level, Massachusetts General Laws Chapter 9, Chapter 254, Sections 26-27C, as amended; and 950 CMR 71.00, 950 CMR 70.00 provides the regulatory framework for the state compliance guidelines, under the jurisdiction of the SHPO. Other relevant legislation and regulations include the National Environmental Policy Act of 1969, as amended;[5] Executive Order 11593, "Protection and Enhancement of Cultural Environment;"[6] Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended,[7] implementing regulation 36 CFR 800, as revised January 2001;

[5] National Environmental Policy Act of 1969, as amended (42 U.S.C. $$ 4321-4347).

[6] Executive Order No. 11593. "Protection and Enhancement of the Cultural Environment," CFR 154 (1971) reprinted in 16 U.S.C.$470 note.

[7] Advisory Council on Historic Preservation. Sections 106 and 110 of the National Historic Preservation Act of 1966 (January 2001) 36 CFR 800.

and, the Procedures for the Protection of Historic Properties (Appendix C) at 33 CFR Part 325 - Processing of Department of the Army Permits.

The historic and archaeological resources intensive surveys for the South Coast Rail project were undertaken in accordance with the Secretary of the Interior's *Standards and Guidelines for Identification* (48 FR 44720-23), the Massachusetts Historical Commission (MHC) standards and guidelines set forth in *Public Planning and Environmental Review: Archaeology and Historic Preservation* (MHC 1985), and the MHC historic resources survey standards. The survey complies with the standards of the MHC, state archaeologist's permit regulations (950 CMR 70), the Secretary of the Interior's *Standards and Guidelines for Identification* (48 FR 44720-23), The Standards of the Massachusetts State Register of Historic Places (State Register), and the National Park Service (NPS) guidelines for assessing eligibility for listing in the National Register, specifically *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. While the surveys conducted to date have informed the impact analysis, additional surveys would be conducted as necessary when more design information is available to further and more specifically assess potential impacts to cultural resources.

4.8.6.1 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966, as amended,[8] seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among agency officials and other parties with an interest in the effects of the undertaking on historic properties. The goal of the consultation is to identify historic properties that might be potentially impacted by the undertaking, assess its effects, and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties.[9]

The Army Corps, as the lead federal agency for the South Coast Rail project, has compliance responsibilities regarding cultural resources under the Procedures for the Protection of Historic Properties (Appendix C) at 33 CFR Part 325 - Processing of Department of the Army Permits, Section 106 of the National Historic Preservation Act (NHPA) as amended, the regulations of the Advisory Council on Historic Preservation (Council) at 36 CFR 800, and the National Environmental Policy Act (NEPA).

4.8.6.2 Massachusetts General Laws, Chapter 9

MassDOT serves as the lead state agency and is responsible for identifying and evaluating properties through archaeological and historic architectural surveys in accordance with MGL Ch. 9 Sections 26-27C, as amended; 950 CMR 71.00, 950 CMR 70.00 and the Massachusetts Environmental Policy Act (MEPA). MGL Chapter 9 Section 26-27C stipulates that any project that requires funding, licenses or permits from any state agency must be reviewed by the SHPO.

[8] Advisory Council on Historic Preservation. Section 106 of the National Historic Preservation Act of 1966 (June 17, 1999) 36 CFR 800.1(a).

[9] Ibid.

4.9 AIR QUALITY

4.9.1 Introduction

This chapter assesses the effects of the alternatives on future air quality conditions at regional (mesoscale) and local (microscale) levels. Section 4.9.2 identifies the air quality analysis methodology. Section 4.9.3 describes the air quality results for the alternatives and their elements. Section 4.9.4 reviews the potential temporary construction impacts and related mitigation. Section 4.9.5 presents a summary of the impacts by each alternative and Section 4.9.6 discusses regulatory compliance. Transportation-related mitigation measures are described in Chapter 4.1, *Transportation*.

The Certificate on the ENF issued by the Secretary of the Executive Office of EEA on April 3, 2009[1] identified the following aspects to be addressed in the evaluation of air quality impacts:

- A mesoscale analysis of volatile organic compounds (VOCs), nitrogen oxides (NO_X), carbon dioxide (CO_2), carbon monoxide (CO), and particulate matter (PM) associated with the project alternatives.
- A microscale analysis of CO, PM_{10}, and $PM_{2.5}$ for hotspot locations that includes vehicles and locomotives around stations and layover facilities where idling emissions will occur.
- An analysis of Greenhouse Gas (GHG) (CO_2) emissions in accordance with MEPA's policy.
- Evaluation in the GHG analysis of electric and diesel fuel options for the trains.
- Evaluation in the GHG analysis of cumulative impacts by alternatives as well as buildings comparing the current state building codes to proposed building with mitigation measures.
- Discussion and consideration in the GHG analysis of recommendations by the Massachusetts Zero Net Energy Building Task Force.
- An investigation as part of the GHG analysis of renewable energy sources and commitment to appropriate LEED and Energy Star elements.
- Evaluation in the GHG analysis of cumulative impacts and the potential effects on freight traffic.
- Commitments in the GHG analysis to using train engine plug-ins and electric block heaters at layover facilities and a discussion of how the project will meet federal locomotive emission standards.

The Secretary's Certificate on the DEIS/DEIR, issued on June 29, 2011, required further analysis or discussion on several aspects of air quality impacts in the FEIS/FEIR. The Certificate states that the FEIS/FEIR should:

[1] Massachusetts Executive Office of Energy and Environmental Affairs. Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. April 3, 2009.

- Include an evaluation of alternative fuels for the enhanced bus and feeder bus services, and commit to use of hybrid and/or other fuels to minimize emission of air pollutants to the maximum extent possible.
- Reiterate commitments to construction-related mitigation measures.
- Identify design and operational features that MassDOT will commit to in order to reduce GHG emissions [greenhouse gas]; including measures to promote GHG reductions associated with transit-oriented development facilities and other induced growth.
- Consult with the Mass Department of Energy Resources (DOER), Division of Green Communities, for assistance in developing a joint approach to promote energy efficiency and GHG reduction in SCR communities.
- Provide an update on consultations with DOER and utility companies on ways that communities can use incentives to mitigate GHG emissions from induced growth.
- Include an outline of the proposed GHG mitigation plan.
- Include the results of revised analysis of induced growth impacts on traffic and air quality.
- Describe in detail specific commitments to contribute to VMT (vehicle miles travelled) and GHG reductions through the feeder bus system.
- Document how the project will comply with MassDEP air quality regulations.

4.9.1.1 Resource Definition

Air quality refers to the ambient concentration of air pollutants in the atmosphere. Air pollutants are substances (naturally occurring or human-generated) that can have adverse effects on human health and/or natural resources. Of special concern are the respiratory effects of the pollutants and their potential toxic effects, as described in Section 4.9.1.3 below.

4.9.1.2 Regulatory Context

The USEPA is responsible for establishing the National Ambient Air Quality Standards (NAAQS), enforcing the Clean Air Act (CAA), and regulating transportation-related emission sources, such as aircraft, ships, and certain types of locomotives. The USEPA also establishes vehicular emission standards.

Clean Air Act and General Conformity Rule

The CAA defines nonattainment areas as geographic regions designated as not meeting one or more of the NAAQS. It requires that a state implementation plan (SIP) be prepared for each nonattainment area, and a maintenance plan be prepared for each former nonattainment area that subsequently demonstrated compliance with the standards. A SIP is a compilation of a state's air quality control plans and rules, approved by USEPA. Section 176(c) of the CAA provides that federal agencies cannot engage, support, or provide financial assistance for licensing, permitting, or approving any project unless the project conforms to the applicable SIP. The state and USEPAs' goals are to eliminate or reduce the severity and number of violations of the NAAQS and to achieve expeditious attainment of these standards.

Pursuant to CAA Section 176(c) requirements, USEPA promulgated Title 40 of the Code of Federal Regulations Part 51 (40 CFR 51) Subpart W and 40 CFR Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (see 58 Federal Register [FR] 63214, [November 30, 1993], as amended, 75 FR 17253 [April 5, 2010]). These regulations, commonly referred to as the General Conformity Rule, apply to all federal actions except for those federal actions which are excluded from review (e.g., stationary source emissions) or related to transportation plans, programs, and projects under Title 23 U.S. Code or the Federal Transit Act, which are subject to Transportation Conformity. The General Conformity Rule applies to all federal actions not addressed by the Transportation Conformity Rule. The South Coast Rail project is not expected to involve funding or approvals from the Federal Highway Administration or the Federal Transit Administration. The Rapid Bus Alternative, which may have required approvals from the Federal Highway Administration associated with changes to the Federal Highway System or other approvals is no longer under consideration. The primary federal approvals required for the project are the NEPA Record of Decision and permits from the U.S. Army Corps of Engineers (the Corps). Therefore, Transportation Conformity does not apply and the applicable conformity regulation is the General Conformity Rule.

The General Conformity Rule is used to determine if federal actions meet the requirements of the CAA and the applicable SIP by ensuring that air emissions related to the action do not:

- Cause or contribute to new violations of a NAAQS.
- Increase the frequency or severity of any existing violation of a NAAQS.
- Delay timely attainment of a NAAQS or interim emission reduction.

A conformity determination under the General Conformity Rule is required if the federal agency determines: the action will occur in a nonattainment or maintenance area; that one or more specific exemptions do not apply to the action; the action is not included in the federal agency's "presumed to conform" list; the emissions from the proposed action are not within the approved emissions budget for an applicable facility; and the total direct and indirect emissions of a pollutant (or its precursors), are at or above the de minimis levels established in the General Conformity regulations (75 FR 17255).

The General Conformity rule defines direct emissions as "caused or initiated by the Federal action and originate in a nonattainment or maintenance area and occur at the same time and place as the action and are reasonably foreseeable." Indirect emissions are defined as emissions of a criteria pollutant or its precursors:

- That are caused or initiated by the Federal action and originate in the same nonattainment or maintenance area but occur at a different time or place as the action;
- That are reasonably foreseeable;
- That the agency can practically control; and
- For which the agency has continuing program responsibility.

For the purposes of this definition of indirect emissions, even if a Federal licensing, rulemaking or other approving action is a required initial step for a subsequent activity that causes emissions, such initial steps do not mean that a Federal agency can practically control any resulting emissions (.40 CFR 93.152).

For the South Coast Rail project, the Corps' Section 404 permit decision may cause temporary construction emissions that would need to be considered under General Conformity. However, the long-term locomotive emissions under the Stoughton or Whittenton Diesel Alternatives would not be subject to General Conformity requirements because the Corps would have no way of controlling the emissions nor any continuing program responsibility over commuter rail operations.

4.9.1.3 Pollutants of Concern and Attainment Status

Carbon Monoxide

CO is a colorless and odorless gas that is a product of incomplete combustion. Carbon monoxide is absorbed by the lungs and reacts with hemoglobin to reduce the oxygen carrying capacity of the blood. At low concentrations, CO has been shown to aggravate the symptoms of cardiovascular disease. It can cause headaches and nausea and, at sustained high concentration levels, can lead to coma and death.

Proposed projects that are located in CO non-attainment or maintenance attainment areas are required to evaluate their impact on CO concentrations and the NAAQS. The alternatives under consideration are located in Fall River, New Bedford, Taunton/East Taunton, Raynham, and Easton/North Easton. These cities along the various alternative corridors are in attainment of air quality standards for CO. A microscale CO analysis was not required under General Conformity because the project is not in a nonattainment or maintenance area, but was conducted for NEPA purposes to better understand the potential effects of the alternatives on air quality.

Particulate Matter

Particulate matter is made up of small solid particles and liquid droplets. PM_{10} refers to particulate matter with a nominal aerodynamic diameter of 10 micrometers or less, and $PM_{2.5}$ refers to particulate matter with an aerodynamic diameter of 2.5 micrometers or less. Particulates can enter the body through the respiratory system. Particulates over 10 micrometers in size are generally captured in the nose and throat and are readily expelled from the body. Particles smaller than 10 micrometers, and especially particles smaller than 2.5 micrometers, can reach the air ducts (bronchi) and the air sacs (alveoli) in the lungs. Particulates are associated with increased incidence of respiratory diseases, cardiopulmonary disease, and cancer. The cities along the alternatives corridors are in attainment of PM standards. A microscale PM analysis was not required under General Conformity because the project is not in a nonattainment or maintenance area, but was conducted for NEPA purposes to better understand the potential effects of the alternatives on air quality.

Ozone

Ozone is a strong oxidizer and an irritant that affects the lung tissues and respiratory functions. Exposure to ozone can impair the ability to perform physical exercise, can result in symptoms such as tightness in the chest, coughing, and wheezing, and can ultimately result in asthma, bronchitis, and emphysema.

Massachusetts has been determined to be a non-attainment area, statewide, for ozone. The Commonwealth has been divided into two non-attainment areas, Eastern and Western Massachusetts. On June 15, 2005, the USEPA revoked the 1-hour ozone standard for most areas in the country. The South Coast Rail alternatives are located in the eastern Massachusetts 8-hour ozone non-attainment area, which has been classified as "Moderate."

Volatile Organic Compounds

VOCs are a general class of compounds containing hydrogen and carbon and are a precursor to the formation of the pollutant ozone. While concentrations of VOCs in the atmosphere are not generally measured, ground-level ozone is measured and used to assess potential health effects. Emissions of VOCs and NO_X react in the presence of heat and sunlight to form ozone in the atmosphere. Accordingly, ozone is regulated as a regional pollutant and not assessed as part of microscale air quality analysis.

Nitrogen Oxides

When combustion temperatures are extremely high, as in automobile engines, atmospheric nitrogen gas may combine with oxygen gas to form various oxides of nitrogen. Of these, nitric oxide (NO) and nitrogen dioxide (NO_2) are the most significant air pollutants. This group of pollutants is generally referred to as nitrogen oxides or NO_X. Nitric oxide is relatively harmless to humans but quickly converts to NO_2. Nitrogen dioxide has been found to be a lung irritant and can lead to respiratory illnesses. Nitrogen oxides, along with VOCs, are also precursors to ozone formation.

Carbon Dioxide

Greenhouse gases (GHG) are essential to maintaining the temperature of the Earth; without them the planet would be so cold as to be uninhabitable. The earth's climate is predicted to change over time, in part because human activities are altering the chemical composition of the atmosphere through the buildup of GHGs. Climate change is having and will continue to have wide ranging impacts on water, energy, transportation, agriculture, ecosystems, and health.[2] While there are other GHGs, carbon dioxide (CO_2) is the predominant contributor to climate change, and emissions can be calculated for CO_2 with readily accessible data.

The EEA issued a policy and protocol for evaluating greenhouse gas (GHG) emissions from proposed projects with particular emphasis on CO_2 emissions.[3] This policy requires that EIR projects quantify greenhouse gas emissions generated by the project and identify measures to reduce or minimize these impacts.

To date, no national standards or thresholds for greenhouse gas emissions applicable to transit projects have been established. USEPA has identified certain greenhouse gases as pollutants under the Clean Air Act and regulatory actions to date have included emissions standards for motor vehicles, fuel standards, and carbon pollution standards for new power plants, among other actions.[4]

On February 18, 2010, the CEQ issued “Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions” for public review and comment.[5] The Draft Guidance addresses when and how to evaluate both the greenhouse gas emissions from proposed actions and the potential impacts of climate change on proposed actions. The Draft Guidance recommends 25,000 metric tons of direct CO_2-equivelent emissions per year as an indicator for when a quantitative greenhouse gas emissions analysis may be appropriate to include in NEPA documents. As of June 2013, the Draft Guidance has not been finalized.

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[2] U.S. Global Change Research Program. 2009. http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf.
[3] 2007 MEPA Greenhouse Gas Emissions Policy and Protocol. http://www.env.state.ma.us/mepa/pdffiles/misc/GHG%20Policy%20FINAL.pdf.
[4] http://www.epa.gov/climatechange/EPAactivities/regulatory-initiatives.html.
[5] http://ceq.hss.doe.gov/nepa/regs/Consideration_of_Effects_of_GHG_Draft_NEPA_Guidance_FINAL_02182010.pdf.

4.9.1.4 Air Quality Standards

The USEPA has set the primary NAAQS to protect public health. Secondary standards set limits to protect public welfare, including protection against visibility impairment, damage to animals, crops, vegetation, and buildings. Table 4.9-1 outlines the primary and secondary NAAQS for all of the criteria pollutants. The predominant source of pollution anticipated from the alternatives under consideration is emissions from project-related motor vehicle traffic. CO and PM are directly emitted by motor vehicles. CO and PM concentrations can be estimated by computer modeling, which can then be compared to the NAAQS.

Table 4.9-1 National Ambient Air Quality Standards

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		primary and secondary	Rolling 3 month average	0.15 μg/m^3	Not to be exceeded
Nitrogen Dioxide		primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		primary and secondary	Annual	53 ppb	Annual Mean
Ozone		primary and secondary	8-hour	0.075 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	$PM_{2.5}$	primary	Annual	12 μg/m^3	annual mean, averaged over 3 years
		secondary	Annual	15 μg/m^3	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24-hour	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: http://www.epa.gov/air/criteria.html. Accessed March 18, 2013.

4.9.2 Methodology

4.9.2.1 Mobile Source Air Quality Modeling Methodology

The USEPA and DEP have established guidelines that define the modeling and review criteria for local and regional air quality analyses prepared pursuant to the MEPA process. These guidelines require that a proposed project determine the change in project related vehicle emissions. If the VOC and emissions from the Build Alternatives are greater than the No-Build Alternative, then a proposed project should include all reasonable and feasible emission reduction mitigation measures. Massachusetts has incorporated this criterion into its SIP.

The USEPA and DEP guidelines require that the air quality study utilize traffic and emissions data for existing and future (No-Build and Build) conditions. The traffic and emissions data are incorporated into the USEPA air quality models and modeling procedures to generate emissions estimates that demonstrate whether or not a proposed project will have air quality impacts.

The air quality study for the project evaluated several conditions, including the 2008 existing conditions, the 2016 and 2030/2035 No-Build Alternative, and the Stoughton and Whittenton Alternatives (electric and diesel variants). The No-Build Alternative (2030 and 2035) included regional background traffic growth and planned roadway improvements. The Build Alternatives include the anticipated future changes in travel demand associated with each alternative. The year 2016 was analyzed as it represented the estimated date of completion at the time the DEIS/DEIR studies were undertaken. In addition, the year 2030 was selected as the future year of analysis for the microscale air quality assessment to be consistent with the statewide model and for consistency with the regional long-range transportation plan at the time the DEIS/DEIR was prepared. For this FEIS/FEIR, the regional (mesoscale) air quality analyses were updated for a 2035 analysis year and updated ridership projections prepared by CTPS (see Chapter 4.1, *Transportation*). Future alternative-related emission calculations are based upon changes in traffic and emission factor data. The traffic data include traffic volumes, vehicle-miles-of-travel, roadway operations, and physical roadway improvements. The emission factor data include emission reduction programs, years of analysis, and roadway speeds.

The microscale and mesoscale analyses developed traffic (volumes and speeds) and emission factor data for the No-Build and Build Alternatives. These data were incorporated into air quality models to demonstrate that the proposed South Coast Rail alternatives will meet the CAAA and SIP criteria. The mesoscale analysis evaluated the regional air quality impacts (VOCs, NO_x, CO_2, CO, and PM emissions) from the alternatives under consideration by determining the change in total ozone precursor emissions (volatile organic compounds and nitrogen oxides) for the existing and future conditions within the study area. The microscale analysis calculated the CO and PM concentrations for the same conditions at congested intersections near the project stations.

The NAAQS for CO, PM, ozone, and other criteria pollutants have been set by the USEPA to protect the public health. The Commonwealth of Massachusetts has adopted the same standards as those set by the USEPA. The predominant sources of air pollution anticipated from the alternatives include emissions of CO, PM, NO_x, and VOCs from locomotive engines and from motor vehicles traveling to and from the stations. Carbon monoxide emissions are emitted predominantly by motor vehicles. PM emissions are emitted by motor vehicles and diesel engines. The impacts of CO and PM are estimated in the microscale analysis by modeling CO and PM concentrations at congested locations, typically intersections, and comparing the results to the NAAQS. Locomotives and vehicles do not directly emit ozone, which is formed through a complex chemical process that occurs when ozone precursor emissions (NO_x and VOCs) react in the presence of sunlight and heat. The ozone impacts due to the proposed project were evaluated by assessing changes in ozone precursor emissions in the mesoscale analysis and comparing the results to the CAAA and conformity criteria.

Microscale Analysis Methodology

The microscale analysis evaluated the CO and PM concentrations at congested intersections in the study area. The intersections selected for microscale air quality modeling were selected based upon the

procedures outlined by the USEPA and as referenced in the DEP guidelines.[6] These procedures require that the intersections be ranked by their level-of-service (LOS) and their total traffic volumes, and that the air quality analysis model the highest three intersections in each ranking. In addition, study intersections were added that would be impacted by station-related traffic and represent those that are in the vicinity of the proposed station sites. Intersections in the study area were ranked based on traffic volumes and level of service. The following intersections were selected for analysis because they were the most congested intersections within the vicinity of each station:

- Taunton Depot, East Taunton: Route 140 at the Route 24 Southbound Ramps
- Easton Village, Easton: Route 138 at Main Street
- Fall River Depot, Fall River: North Davol Street and South Davol Street at President Avenue
- Freetown Station, Freetown: South Main Street at Route 24 Northbound Ramps
- King's Highway, New Bedford: Church Street at Tarkiln Road
- North Easton, North Easton: Route 138 at Main Street
- Raynham Park, Raynham: Route 138 at Foundry Street/Route 106
- Dean Street, Taunton: Route 44 at Longmeadow Road
- Taunton Depot, Taunton: Route 140 at the Route 24 Northbound without Slip Ramp
- Dana Street, Taunton: Washington Street at Tremont Street
- Whale's Tooth, New Bedford: Union Street at McArthur at Route 18 at State Pier
- Relocated Stoughton Station, Stoughton: Brock Street/Kinsley Street at Washington Street

The impacts of the alternatives on the nearest residences were assessed for CO and PM emissions to determine whether the emissions are below (in compliance with) the required standards.

The microscale analysis calculated maximum 1-hour and 8-hour CO concentrations, the 24-hour and annual $PM_{2.5}$ concentrations, and the 24-hour PM_{10} concentrations. The USEPA's computer model CAL3QHC[7] was used to predict CO and PM concentrations at receptor locations for each intersection. These receptor locations were selected since they are located where the public has access and is expected to be for periods of time. Receptors were placed at the edge of the roadway, but not closer than 10 feet (3 meters) from the nearest travel lane, so that they were not within the roadway mixing cell. The results calculated at these receptor locations represent the highest concentrations at each intersection. Receptor locations farther away from the intersections will have lower concentrations because of the CO and PM dispersion characteristics. The receptor locations that are along the major

[6] Guidelines For Modeling Carbon Monoxide From Roadway Intersection, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division; Research Triangle Park, NC; EPA-454/R-92-005; November 1992.

[7] User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections, US Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division; Research Triangle Park, NC; EPA-454/R-92-006; November 1992.

roadways in the study area are also expected to have lower CO and PM concentrations than intersection receptors. The reason for this is that emission rates for vehicles traveling along these roadways are much lower than the emission rates for vehicles queuing at intersections, with stop-and-go traffic.

Subsequent to the DEIS/DEIR, updated microscale analyses were performed to assess the effects of relocating the Stoughton Station. All other microscale analyses remain the same as presented in the DEIS/DEIR—given that the results show concentrations well below the NAAQS, updating the analyses to account for the latest ridership and operating plan would not change the conclusions regarding the effects of the alternatives on air quality at the local level.

The potential for traffic changes as a result of the selection of the Dana Street Station in Taunton to replace the Downtown Taunton Station were evaluated and it was concluded that an updated microscale analysis was not warranted. The vehicle trips related to the proposed Dana Street Station as based on ridership modeling are less than half of the previous estimates for the Downtown Taunton Station. When compared to the Downtown Taunton Station analyzed in the DEIS/DEIR, this removes a substantial amount of project-related vehicular traffic from the downtown Taunton area and reduces project impacts related to the station. Although it is projected by CTPS that a higher percentage of riders would drive to a station on Dana Street (69 percent of riders) when compared to a station in Downtown Taunton (44 percent), the overall number of vehicle trips to and from the Dana Street Station is still substantially lower compared to the Downtown Taunton station location. Therefore, the results of the DEIS/DEIR air quality impact analysis for the Washington Street at Tremont Street intersection are conservatively high. The DEIS/DEIR analysis indicated that these impacts would not be significant and further impact analysis specific to the Dana Street Station is therefore not necessary.

Background Concentrations

The 1-hour pollutant concentrations were calculated directly using the USEPA computer model, with evening peak hour traffic and emissions data.

CO Background and Persistence Factors—The 8-hour CO concentrations were derived by applying a persistence factor of 0.70 to the 1-hour CO concentrations. The concentrations are expressed in parts per million (ppm) and include a 1-hour and 8-hour background concentration of 3.0 ppm and 2.1 ppm respectively. The CO persistence factor and background concentration are based on USEPA's suggested factors. The 1-hour NAAQS for CO is 35 ppm. The emissions presented represent the highest emissions experienced at each intersection for each alternative. The air quality analysis assumes that if these intersections meet the NAAQS, then all other intersections, regardless of alternative, which would have lower volumes and better levels of service, can be assumed to also meet the NAAQS. The remaining intersections are included in Appendix 4.9-A.

PM_{10} Background and Persistence Factors—The microscale analysis calculated the 24-hour PM_{10} concentrations for the No-Build Alternative and the Build Alternatives. The 1-Hour PM_{10} concentrations were calculated directly using the USEPA's CAL3QHC model, with evening peak hour traffic and emission data. The 24-hour PM_{10} concentrations were calculated by applying the USEPA persistence factor of 0.40 to the 1-hour concentrations. The concentrations are expressed in micrograms per cubic meter ($\mu g/m^3$) and include a 24-hour background concentration of 45.7 ug/m^3, which was based on DEP air quality monitoring data. The background concentrations are conservative because they were calculated from

the DEP's annual monitoring report[8] at DEP's Boston area (Kenmore Station) permanent monitoring station. The 24-hour NAAQS for PM_{10} is 150.0 μg/m^3.

$PM_{2.5}$ Background and Persistence Factors—The microscale analysis calculated the 24-hour and annual $PM_{2.5}$ concentrations for the No-Build Alternative and the Build Alternatives. The 1-hour $PM_{2.5}$ concentrations were calculated directly using the USEPA's CAL3QHC model, with evening peak hour traffic and emission data. The 24-hour $PM_{2.5}$ concentrations were calculated by applying the USEPA persistence factor of 0.40 to the 1-hour concentrations and 0.08 for the annual $PM_{2.5}$. The concentrations are expressed in micrograms per cubic meter (μg/m^3) and include a 24-hour background concentration of 29.7 μg/m^3, and an annual background concentration of 11.7 μg/m^3 which was based on DEP air quality monitoring data. The background concentrations were also calculated from the DEP's annual monitoring report[9] at DEP's Boston-area (Kenmore Station) permanent monitoring station. The 24-hour NAAQS for $PM_{2.5}$ is 35.0 μg/m^3 and 15.0 μg/m^3 for the annual standard.

The highest CO, $PM_{2.5}$ and PM_{10} concentration and its receptor location presented in Section 4.9.3 represent the highest concentrations for each intersection. Receptor locations located farther away from the intersection have lower concentrations because of the pollutant's dispersion characteristics. Receptor locations that are along major roadways are also expected to have lower pollutant concentrations, because the emission factors for vehicles traveling along these roadways are much lower than the emission rates for vehicles queuing at the modeled intersections. The receptor locations for each intersection are presented in Figures 4.9-1 through 4.9-7.

Emission Factors

The vehicle emission factors used in the microscale and mesoscale analysis were obtained using the USEPA's Mobile Source Emission Factor Model, MOBILE6.2,[10] which calculates emission factors from motor vehicles in grams per vehicle-mile for existing and future conditions. The emission rates calculated in this air quality study are adjusted to reflect Massachusetts-specific conditions such as the vehicle age distribution, the statewide Inspection and Maintenance (I/M) Program, and the Stage II Vapor Recovery System.[11] VOC and NO_x emission factors for the mesoscale analysis were determined using the DEP recommended temperatures for the summer (ozone) season and similarly for the microscale analysis, the CO emission factors were determined using winter (CO) season temperatures. The MOBILE6.2 input data are presented in Appendix 4.9-A. The MOBILE6.2 model was the latest USEPA-approved mobile source emissions model at the time the DEIS/DEIR was prepared and remains appropriate for assessing the effects of the alternatives in this FEIS/FEIR.

The air quality study used traffic data (volumes, delays, and speeds) developed for each analysis condition. The microscale analysis used the evening peak hour traffic conditions during the CO season (winter).

Train Emissions for Microscale Analysis—There would be no train emissions under the electric Build Alternatives, but the diesel Build Alternatives would result in additional particulate matter emissions.

[8] 2000 Annual Report on Air Quality in New England, US Environmental Protection Agency, Region I, Lexington, Massachusetts; July 2001.

[9] 2000 Annual Report on Air Quality in New England, US Environmental Protection Agency, Region I, Lexington, Massachusetts; July 2001.

[10] MOBILE6.2 (Mobile Source Emission Factor Model), May 2004 release from US EPA, Office of Mobile Sources, Ann Arbor, MI.

[11] The Stage II Vapor Recovery System is the process of collecting gasoline vapors from vehicles as they are refueled. This requires the use of a special gasoline nozzle at the fuel pump.

These diesel train emissions were accounted for by adding the train emissions to the motor traffic-related emissions in the CAL3QHC model. Diesel locomotive emission factors were based on USEPA guidance reproduced in Appendix 4.9-A.[12] As a result, the air quality modeling for the diesel alternatives represents the total air quality impact. As discussed below, analysis also considered the impact of diesel locomotives idling at the stations (and thus generating higher pollutant concentrations than would occur with a moving train).

For the diesel Build Alternatives, two scenarios were evaluated in the analysis of each receptor; the train idling in the station and the train traveling along the rail line. The first scenario was analyzed by treating the train idling at the station in the CAL3QHC model as an unsignalized intersection with the train sitting idle for 70 seconds of the 120 second cycle which equates to a conservative 35 minutes of idling during an hour. The emission factors used for the train idling were the “Large Switch” emissions factors which are the closest locomotive emission factors for “idling” available in the USEPA guidelines. In addition to the train idling, a moving train along the rail line was also analyzed at each receptor. These moving trains were assessed as freeflow links in the CAL3QHC model and assumed “Passenger Commuter Rail” locomotive emission factors from the USEPA guidelines. The number of trains on the freeflow links (a maximum of 5 trains per hour) was based on the estimated rail schedules. The locomotive emissions factors assumed in the air quality analysis reflect the assumption that all locomotives added to the rail corridor for the South Coast Rail project would be new locomotives.

Analysis of Sensitive Areas for NO_x—In addition to air quality analysis conducted for the intersections in proximity to the stations, the impacts of the alternatives on air quality in the vicinity of proposed overnight layover facilities were examined. USEPA’s atmospheric model AERMOD modeling procedures were used to model locomotive emissions at stations, layover facilities, and environmentally sensitive areas, such as the Hockomock Swamp. AERMOD is appropriate for chemically stable, gaseous or fine particulate pollutants, such as CO, NO_x, and PM. It incorporates multiple sources, meteorological data, source emission data, stack and building geometry, and detailed surrounding land use and topography. These data were incorporated into AERMOD to generate concentrations that demonstrate whether or not the proposed project would comply with the NAAQS or cause air impacts.

Mesoscale Analysis Methodology

The predominant sources of regional pollution impacts anticipated from the proposed South Coast Rail project are emissions reductions resulting from modal travel shifts from private automobiles to rail service. The mesoscale analysis uses traffic and emissions data for existing and future (No-Build and Build) conditions for each alternative. The general modeling process to determine whether the alternatives would have air quality impacts utilized link-by-link data from the Central Transportation Planning Staff (CTPS) state-wide traffic model and emission factors derived using the USEPA’s MOBILE6.2 emission factor model. The link-by-link traffic data includes daily vehicle volumes as well as free flow and congested speeds over each link. The vehicle volumes are combined with the link lengths in order to determine the daily VMT over the link. The VMT is then multiplied by the appropriate speed-specific emission factors in order to arrive at the total daily emissions for each link.

The roadways included in the mesoscale study area include the roadways coded in the CTPS state-wide model and generally includes Eastern Massachusetts. The mesoscale analysis estimated the future regional VOCs, NO_X, CO_2, CO, and PM emissions due to the changes in average daily traffic volume,

[12] Emission Factors for Locomotives United States Environmental Protection Agency, Office of Transportation and Air Quality, EPA-420-F-09-025 April 2009.

roadway characteristics, and vehicle emissions. The mesoscale analysis traffic (volumes, delays, and speeds) and emission factor data were developed for the above listed conditions.

The objective of the mesoscale analysis was to estimate the change in area-wide emissions of ozone precursor VOCs, NO_X, CO, and PM emissions during a typical day and CO_2 emissions during the entire year resulting from implementing the proposed South Coast Rail project. The daily area-wide emissions are presented in kilograms per day to be consistent with conformity criteria and SIP budgets and in terms of tons per year to be consistent with Massachusetts GHG policy.

The air quality study used traffic data (volumes, delays, and speeds) developed for each analysis condition. The microscale analysis used the evening peak hour traffic conditions during the CO season (winter). The mesoscale analysis for VOC and NO_x emissions used typical daily peak and off-peak traffic volumes for the ozone season (summer). Vehicle speeds are developed based upon traffic volumes, observed traffic flow characteristics, and roadway capacity.

Stationary Source Air Quality Modeling Methodology

Stationary source analysis for greenhouse gases included direct and indirect CO_2 emissions. The following outlines the stationary source analysis approach for the proposed stations and layover facility alternatives.

Station Analysis—A stationary source analysis was not conducted for the stations because there are no buildings proposed as part of the stations for the South Coast Rail project. The stations would only include a platform. There are some electrical requirements for each station but the emissions related to the minimal electrical requirements are considered negligible.

Layover Facility—A stationary source analysis was conducted for the layover facilities and is presented in Section 4.9.3.8. The stationary source analysis assessed the emissions due to the trains idling and/or plugging-in at the layover facilities. The layover facilities would be open buildings with no heating fuel emissions.

Greenhouse Gas Analysis

The Massachusetts Executive Office of Energy and Environmental Affairs has established a GHG emissions policy. The policy requires that proponents of projects undergoing MEPA review quantify greenhouse gas emissions and identify measures to avoid, minimize, and mitigate those emissions. MEPA has developed procedures and guidelines for implementing this policy, which was originally released in 2007. The most recent version of the policy was released in 2010 with an effective date of May 5, 2010.

The MEPA Certificate for the South Coast Rail project called for the GHG modeling of direct and indirect sources. These sources include motor vehicles, buses, diesel trains, electric trains, stations, layover facilities, and buildings.

Additional GHG effects, including an assessment of the greenhouse implications of a Smart Growth scenario are discussed in Chapter 5, *Summary of Indirect Effects and Cumulative Impacts*. The Smart Growth scenario analyzed in Chapter 5 is primarily anticipated to affect the GHG emissions caused by motor vehicles, which would be affected by implementing smart growth and transit-oriented development policies. Smart Growth programs include other “green” policies and goals in addition to

transportation improvements, such as building energy efficiency, travel behavior changes, etc. The development patterns associated with the Smart Growth programs, such as Transit Oriented Development in the vicinity of new or existing transit stations may result in different (higher) building densities, and other characteristics, thereby potentially resulting in different GHG reduction benefits, including those recognized by the State under the Global Warming Solution Act (GWSA).

Modeling

Mesoscale mobile source emissions were calculated for all of the major transportation modes in eastern Massachusetts for different years. The modes consist of on-road vehicles such as autos, trucks, and buses as well as certain off-road sources like water transportation and commuter rail. The methodology being used for the South Coast Rail project is the same one that is used for the Federal Certification Activities conducted by the Metropolitan Boston Planning Organization (Boston Region MPO). This methodology has been used in the Regional Metropolitan Transportation Planning process, Air Quality Conformity Determination, and numerous other highway and transit projects.

Mobile vehicle emissions were modeled using USEPA's MOBILE6.2 emission factor model and CTPS's regional travel demand model. This was conducted for existing conditions and No-Build and Build Alternatives. Bus emissions were calculated separately using a mesoscale analysis.

In order to have a net reduction in greenhouse gas emissions, a Build Alternative would have to divert automobile travel to transit to a degree that the reduction in motor vehicle emissions from automobiles would more than offset the increase resulting from a Build Alternative's CO_2 emissions. The extent to which Build Alternatives would reduce greenhouse gas emissions associated with vehicular travel depends on the estimated diversion of the use of motor vehicles to transit. This "mode-shift" from motor vehicles to transit results in reductions of VMT, which reduces motor vehicle emissions. It also contributes to reduction in traffic congestion, which can also reduce vehicular emissions due to lower emissions associated with improved traffic flow, rather than stop-and-go.

Motor Vehicles—The USEPA's MOBILE6.2 emission model for autos and trucks includes:

- Description of the calculation for auto and truck (motor vehicles) emissions as a function of the MOBILE6.2 emission rates and the Regional Travel Demand Models (RTDM) estimate of VMT and congested speed.
- Description of the sources of emissions rates and the method used to calculate pollutant emissions for the public transportation vehicles.
- The end product is the estimate of total emissions for a scenario and year.

The unit for measuring emission rates for motor vehicles is grams per mile and were calculated using MOBILE6.2, the software developed by USEPA. The MPO coordinated with MassDEP to develop the inputs to the MOBILE6.2 model for application by the Boston MPO in their air quality modeling. MOBILE6.2 requires a wide range of input parameters, including inspection and maintenance program information and other data such as hot/cold start mix, emission failure rates, vehicle fleet mix, and fleet age distribution. The inputs used for the 2000 Base Year were the same as those used in determining the latest emissions inventory for the Commonwealth of Massachusetts. The inputs used for the years 2009 through 2035 were also received from DEP and include information on programs that were submitted to the USEPA as the strategy for the Commonwealth to obtain ambient air quality standards.

MOBILE6.2 produces a lookup table showing grams produced per mile of travel; stratified by roadway type, and speed for each pollutants and season. Lookup table 1 contains freeway emission rates for 2035 and Lookup table 2 contains emission rates for arterials. Emissions rates are provided for the greenhouse gas (CO_2) using MOBILE6.2. It should be noted that the current MOBILE6.2 emission factor model can only generate a CO_2 grams per mile based on fleet average fuel economy for the year modeled and does not vary based on vehicle speed, or roadway type. USEPA's next motor vehicle emission model, "MOVES -Motor Vehicle Emissions Simulator", provides improved capabilities for assessing greenhouse gas emissions, but was not available for official use at the time this study was prepared.[13]

The calculation of emissions for the greenhouse gas (CO_2) produced by motor vehicles, including park-and-ride and kiss-and-ride trips are a function of four factors:

- VMT
- Congested speeds on the roadways
- Type of roadway (limited access vs. full access)
- Emission factors for the pollutants from MOBILE6.2 by season

The Regional Travel Demand Model (RTDM) includes every major highway, arterial, and collector in the study area. The centroid connectors are a proxy for the local roads. These roadways are represented as links, segments of roadways that have motor vehicles assigned to them in each alternative. Each roadway link and centroid connector has a roadway type and distance associated with it. The highway assignment process calculates how many vehicles are on each link and centroid connector and what its congested speed would be by time of day. VMT is a function of how many vehicles are on a link and the length of that link. This parameter was calculated for every link in the model area. The emission factors were held constant in this study for 2035.

The emission factor for CO_2 identified for each link and centroid connector based on its roadway type and congested speed. The emissions produced on each link and centroid connector was simply the product of the emission rate for CO_2 and the VMT. The total emissions were simply the sum of CO_2 for all of the links in the study area by time period. The four time periods are summed to arrive at an emission estimate for an average weekday in 2035.

Observed emission changes are due to mode shifts from auto to transit, resulting in lower VMT and possibly lower congested speeds on the roadway network. Hence, the more auto diversions there are, the more likely the air quality measures will improve from this mode.

Train Emissions—Diesel train emissions were modeled using the most recently approved USEPA train emission factors and the train network and volumes as discussed below. The electric train emissions are modeled based upon the amount of electricity that they use which is also discussed in more detail below.

[13] The Notice of Availability approving the MOVES2010 model for SIP development and transportation conformity regional emissions analysis was published in the Federal Register on March 2, 2010. A two-year grace period is provided before MOVES2010 is required for new regional emissions analyses. At the time of the preparation of the DEIS/DEIR, MOVES2010 had not yet been approved for project-level CO and PM hot-spot analysis pending the release of EPA guidance and a separate Federal Register notice.

The South Coast Rail train emissions are calculated by using the USEPA passenger/commuter train emission factors and the total distance between South Station and the endpoints of the Southern Triangle for each alternative. Estimates of rail emissions in the Eastern Massachusetts region are based upon the factors received by CTPS in 2009 guidance from the USEPA Office of Transportation and Air Quality (OTAQ) and documented on their web site at: www.epa.gov/otaq/locomotives.htm.

The number of train miles is estimated from a breakdown of track mileage by train line and community. Train mileage is a function of the train frequency data using present, and proposed commuter rail schedules. Multiplying the train miles per day by the vehicular emissions per train mile yields the estimated vehicular emissions per day in the Eastern Massachusetts for CO_2. Using the CO_2 emission factors provided by the E.P.A. (Emission factor = 3405.67 g/mile), the total emissions for each alternative for the years 2016 and 2030 are calculated as follows:

- Total CO_2 Emissions (by alternative) = CO_2 Passenger/Commuter Train Emission Factor (tons per year)* Total Distance Traveled by each Train * Number of trains per day

Similarly, the project CO_2 emissions produced by the electric trains in the electric alternatives were also calculated. The total amount of travel time is calculated for each train per trip, which includes the time for traveling round-trip plus the amount of time to move to the layover facility and back to the terminal station. The projected electric consumption for each train trip is calculated as follows:

- Total electric consumption = Kilowatts consumed by 1 train per trip * the amount of travel for each train trip time required for each trip (in kilowatt-hours (kWh))

The electric consumption for each train per trip in kWh is then converted into tons of CO_2 per year as follows:

- Total GHG consumption = kWh * 1megawatt-hours (mwh)/1,000kwh * number of trains per day * 1,107lbs/Mwh *0.0005 tons/lbs*365 days/year

The emission rate of 1,107 lbs of CO_2 per mwh is based on the 2005 marginal emission rate for New England electricity generation as calculated by ISO New England Inc.[14] (the New England Independent System Operator [ISO] for electricity). This rate takes into account the various electricity sources used in the New England system (coal, nuclear, natural gas, hydroelectric etc.).

4.9.3 Analysis of Impacts

The following identifies potential long-term air quality impacts resulting from implementation of the alternatives. The discussion of potential air quality impacts begins with the No-Build Alternative and continues to the Build Alternatives including alignments, stations, and layover facilities. Figure 4.8-1 shows the South Coast Rail alternatives and existing stations.

4.9.3.1 No-Build (Enhanced Bus) Alternative

The No-Build Alternative would consist of enhancing current bus service along existing roads and highways. It was assumed that the limited increase in bus service along the roadways would have a minimal effect on the air quality within the study area. Table 4.9-2 presents a summary of the air quality

[14] See the ISO New England Inc. 2007 New England Marginal Emission Rate Analysis, Table 5.6. http://www.iso-ne.com/genrtion_resrcs/reports/emission/2007_mea_report.pdf.

levels for the mesoscale (regional) analysis for the Existing Conditions and No-Build (Enhanced Bus) Alternative for the various pollutants.

Table 4.9-2 Mesoscale No-Build Analysis Emissions Results

	Units	2010 Existing	2035 No-Build
Vehicle Miles Traveled (VMT)	Average Miles/day	109,926,000	118,897,192
Volatile Organic Compounds (VOC)	Kg/day	48,810	22,200
Oxides of Nitrogen (NO_x)	Kg/day	118,010	19,256
Particulate Matter 10 (PM_{10})	Kg/day	4,780	3,240
Particulate Matter 2.5 ($PM_{2.5}$)	Kg/day	3,010	1,490
Carbon Monoxide (CO: Winter)	Kg/day	1,516,100	1,050,356
Carbon Dioxide (CO_2)[1]	Tons/year	22,334,463	24,717,339

1 The CO_2 was calculated assuming an annualization factor of 365 days/year and 1000kg/1 ton.
Note: Emissions quantities rounded to the nearest 10.

The mesoscale and microscale analyses indicate that reductions in pollutant concentrations are expected to occur over time relative to the Existing Condition. With the exception of carbon dioxide, all of the calculated future No-Build regional emissions are less than the existing conditions emissions. These reductions can be mostly attributed to more efficient vehicles with enhanced emissions control technologies and the benefits of the Massachusetts Vehicle Inspection and Maintenance program.

The intersections that were analyzed as part of the microscale analysis are representative of the air quality impacts in the study areas surrounding the proposed train stations. Table 4.9-3 summarizes the results of the No-Build conditions for the microscale analysis. Table 4.9-3 shows the highest CO, $PM_{2.5}$ and PM_{10} concentrations at each intersection under the 2016 and 2030 No-Build conditions. No exceedances of the NAAQS are anticipated.

4.9.3.2 Southern Triangle Study Area (Common to all Build Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all Build Alternatives. These rail lines form a rough triangular shape between the Fall River Secondary and the New Bedford Main Line, and are therefore referred to as the Southern Triangle. The northern part of the South Coast Rail study area is encompassed by the other Build Alternatives described in subsequent sections.

The mesoscale analysis for the Southern Triangle is included in the alternatives analysis presented in this section (Stoughton and Whittenton Alternatives) due to the regional nature of the analysis and the need to analyze the rail line as a whole in order to assess its regional air quality benefits. The following sections summarize the microscale (local) analysis results for the Southern Triangle stations.

Fall River Secondary Rail Segment

The existing Fall River Secondary freight track would be upgraded to Federal Rail Administration (FRA) Class 5[15] for the South Coast Rail project. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the Fall River Secondary is diesel-powered; no electrical infrastructure is present. New

[15] 49 CFR 213.9 Classes of Track: Operating Speed Limits

catenary supports and wires would need to be constructed along the length of the line and two new traction power facilities would need to be constructed for the electric alternatives. Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one new station would be constructed in Freetown (Freetown). One new layover facility would be constructed in Fall River, at either the Weaver's Cove site or the ISP site.

Tables 4.9-4 and 4.9-5 summarize the microscale (local) analysis results for the Southern Triangle portion of the project for the Fall River Secondary for the diesel and electric alternatives, respectively. As shown in the tables there are minor differences between the diesel and electric alternatives for the microscale (local) analysis. Figure 4.9-1 shows the microscale air quality study area for Fall River, and Figure 4.9-2 shows the Freetown study area. All of the pollutant concentrations are well below the NAAQS standards for both the diesel and electric alternatives.

Table 4.9-3 Microscale (Local) Predicted Maximum Pollutant Concentrations, 2016 and 2030 No-Build

				2016					2030				
				Carbon Monoxide (CO in ppm)	Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$)			Particulate Matter 10 (PM_{10} in $\mu g/m^3$)	Carbon Monoxide (CO in ppm)	Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$)			Particulate Matter 10 (PM_{10} in $\mu g/m^3$)
Town	Station	Intersection No. and Intersection	Quadrant	1-Hour	8-Hour	24-Hour	Annual	24-Hour	1-Hour	8-Hour	24-Hour	Annual	24-Hour
Stoughton	Stoughton	Brock Street/Kinsley Street at Washington Street	NE	3.7	2.6	22.7	9.9	40.5	3.7	2.6	22.7	9.9	40.5
			SE	3.7	2.6	22.7	9.9	40.5	3.7	2.6	22.7	9.9	40.5
			SW	3.7	2.6	22.7	9.9	40.5	3.7	2.6	22.7	9.9	40.5
			NW	3.7	2.6	22.7	9.9	40.5	3.7	2.6	22.7	9.9	40.5
East Taunton	Taunton Depot	Route 140 at the Route 24 Southbound Ramps	E	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	47.3
			SW	4.3	3	30.5	11.9	47.3	4.3	3	30.5	11.9	47.3
			NW	4.3	3	30.5	11.9	47.3	4.3	3.4	30.5	11.9	47.3
Easton	Easton Village	Route 138 at Main Street	NE	4.5	3.2	30.5	11.9	47.3	4.5	3.2	30.5	11.9	47.3
			SE	4.6	3.2	30.5	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			SW	4.7	3.3	30.5	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			NW	4.6	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
Fall River	Fall River Depot	North Davol Street and South Davol Street at President Avenue	NE	4.1	2.9	30.5	11.9	46.9	4.1	2.9	30.1	11.8	46.9
			SE	4.2	2.9	30.5	11.9	46.9	4.2	2.9	30.1	11.8	46.9
			SW	3.9	2.7	30.5	11.9	46.9	4.2	2.9	31.1	12.6	46.9
			NW	4.2	2.9	30.5	11.9	47.3	4	2.9	30.5	11.9	46.9

				2016					2030				
				Carbon Monoxide (CO in ppm)	Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$)			Particulate Matter 10 (PM_{10} in $\mu g/m^3$)	Carbon Monoxide (CO in ppm)	Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$)			Particulate Matter 10 (PM_{10} in $\mu g/m^3$)
Town	**Station**	**Intersection No. and Intersection**	**Quadrant**	**1-Hour**	**8-Hour**	**24-Hour**	**Annual**	**24-Hour**	**1-Hour**	**8-Hour**	**24-Hour**	**Annual**	**24-Hour**
Freetown	Freetown	South Main Street at Route 24 Northbound Ramps	N	4	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	46.9
			SE	4	2.8	30.5	11.9	47.3	4	2.8	30.1	11.8	46.9
			SW	4	2.8	30.5	11.9	46.9	4	2.8	30.1	11.8	46.9
New Bedford	King's Highway	Church Street at Tarkiln Road	NE	3.8	2.7	27.1	11.8	46.9	3.8	2.7	30.1	11.8	46.5
			SE	3.8	2.7	30.1	11.8	46.9	3.8	2.7	30.1	11.8	46.5
			SW	3.9	2.7	30.1	11.8	46.9	3.9	2.7	30.1	11.8	46.9
			NW	3.8	2.7	30.1	11.8	46.5	3.8	2.7	30.1	11.8	46.5
North Easton	North Easton	Route 138 at Main Street	NE	4.5	3.2	30.5	11.9	47.3	4.5	3.2	30.5	11.9	47.3
			SE	4.6	3.2	30.5	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			SW	4.7	3.3	30.5	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			NW	4.6	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
Raynham	Raynham Park	Route 138 at Foundry Street/Route 106	NE	4.1	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	47.3
			SE	4	2.8	30.5	11.9	47.3	4	2.8	30.5	11.9	46.9
			SW	4.1	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	46.9
			NW	4	2.8	30.5	11.9	47.3	4	2.8	30.5	11.9	46.9
Taunton	Dean Street	Route 44 at Longmeadow Road	NE	4.6	3.2	30.5	11.9	47.3	4.6	3.2	30.5	11.9	47.3
			SE	4.3	3	30.5	11.9	47.3	4.3	3	30.5	11.9	47.3
			SW	4.7	3.3	30.5	11.9	47.7	4.7	3.3	30.5	11.9	47.7
			NW	4.5	3.2	30.5	11.9	47.7	4.5	3.2	30.5	11.9	47.7

Town	Station	Intersection No. and Intersection	Quadrant	2016 Carbon Monoxide (CO in ppm) 1-Hour	2016 Carbon Monoxide (CO in ppm) 8-Hour	2016 Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$) 24-Hour	2016 Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$) Annual	2016 Particulate Matter 10 (PM_{10} in $\mu g/m^3$) 24-Hour	2030 Carbon Monoxide (CO in ppm) 1-Hour	2030 Carbon Monoxide (CO in ppm) 8-Hour	2030 Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$) 24-Hour	2030 Particulate Matter 2.5 ($PM_{2.5}$ in $\mu g/m^3$) Annual	2030 Particulate Matter 10 (PM_{10} in $\mu g/m^3$) 24-Hour
Taunton	Taunton Depot	Route 140 at the Route 24 Northbound without Slip Ramp	NE	4.7	3.3	30.5	11.9	48.1	4.7	3.3	30.9	11.9	48.1
			S	4.8	3.4	30.5	11.9	48.5	4.8	3.4	32.1	12.2	49.3
			NW	4.9	3.4	30.5	11.9	48.5	4.9	3.4	30.9	11.9	48.1
Taunton	Dana Street	Washington Street at Tremont Street	NE	4.2	2.9	30.5	11.9	47.3	4.3	3	30.5	11.9	46.9
			SE	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	46.9
			SW	4	2.8	30.5	11.9	46.9	3.9	2.7	30.1	11.8	46.9
			NW	4.4	3.1	30.5	11.9	47.3	4.4	3.1	30.5	11.9	47.3
New Bedford	Whale's Tooth	Union Street at McArthur at Route 18 at State Pier	NE	4	2.8	30.1	11.8	46.9	4.3	3	30.1	11.8	46.9
			SE	4.2	2.9	30.5	11.9	46.9	4.5	3.2	30.1	11.8	46.9
			SW	4.2	2.9	30.5	11.9	47.3	4.7	3.3	30.5	11.9	46.9
			NW	4.4	3.1	30.5	11.9	47.3	4.8	3.4	30.1	11.9	47.3

Table 4.9-4 Predicted Maximum Pollutant Concentrations, Southern Triangle: Fall River Secondary- Electric

Town	Station	Intersection	Receptor Location at Intersection	Year 2016					Year 2030				
				Carbon Monoxide (CO in ppm)		Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3)		Particulate Matter 10 (PM_{10} in µg/m^3)	Carbon Monoxide (CO in ppm)		Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3)		Particulate Matter 10 (PM_{10} in µg/m^3)
				1-Hour	8-Hour	24-Hour	Annual	24-Hour	1-Hour	8-Hour	24-Hour	Annual	Annual
Fall River	Fall River Depot	N. Davol St. and South Davol St. at President Ave.	Northeast	4.1	2.9	30.5	11.9	46.9	4.1	2.9	30.1	11.8	46.9
			Southeast	4.2	2.9	30.5	11.9	46.9	4.2	2.9	30.1	11.8	46.9
			Southwest	3.9	2.7	30.5	11.9	46.9	4.2	2.9	30.1	11.8	46.9
			Northwest	4.2	2.9	30.5	11.9	46.9	4.2	2.9	30.1	11.8	46.9
Freetown	Freetown	S. Main St. at Rte 24 Northbound Ramps	North	4.1	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	46.9
			Southeast	4.0	2.8	30.5	11.9	47.3	4.0	2.8	30.1	11.8	46.9
			Southwest	4.1	2.9	30.5	11.9	46.9	4.0	2.8	30.1	11.8	46.9

Table 4.9-5 Predicted Maximum Pollutant Concentrations, Southern Triangle: Fall River Secondary- Diesel

Town	Station	Intersection	Receptor Location at Intersection	Year 2016 Carbon Monoxide (CO in ppm) 1-Hour	Year 2016 Carbon Monoxide (CO in ppm) 8-Hour	Year 2016 Particulate Matter 2.5 ($PM_{2.5}$ in µg/m3) 24-Hour	Year 2016 Particulate Matter 2.5 ($PM_{2.5}$ in µg/m3) Annual	Year 2016 Particulate Matter 10 (PM_{10} in µg/m^3) 24-Hour	Year 2030 Carbon Monoxide (CO in ppm) 1-Hour	Year 2030 Carbon Monoxide (CO in ppm) 8-Hour	Year 2030 Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3) 24-Hour	Year 2030 Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3) Annual	Year 2030 Particulate Matter 10 (PM_{10} in µg/m^3) 24-Hour
Fall River	Fall River Depot	North Davol Street and South Davol Street at President Avenue	Northeast	4.1	2.9	30.5	11.9	46.9	4.1	2.9	30.1	11.8	46.9
			Southeast	4.2	2.9	30.5	11.9	46.9	4.2	2.9	30.1	11.8	46.9
			Southwest	3.9	2.7	30.5	11.9	46.9	4.2	2.9	30.1	11.8	46.9
			Northwest	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.1	11.8	46.9
Freetown	Freetown	South Main Street at Route 24 Northbound Ramps	North	4.1	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	46.9
			Southeast	4.0	2.8	30.5	11.9	47.3	4.0	2.8	30.1	11.8	46.9
			Southwest	4.1	2.9	30.5	11.9	46.9	4.0	2.8	30.1	11.8	46.9

New Bedford Main Line Rail Segment

The existing New Bedford Main Line freight track would be upgraded to FRA Class 5 for the South Coast Rail project. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the New Bedford Main Line is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and four or five traction power facilities (depending upon the alternative selected) would need to be constructed for the electric alternatives. Two new train stations would be constructed in New Bedford (Whale's Tooth and King's Highway) and one new train station would be constructed in Taunton (Taunton Depot). One new layover facility would be constructed in New Bedford, at the Wamsutta site.

Tables 4.9-6 and 4.9-7 summarize the microscale (local) analysis results for the Southern Triangle portion of the project for the New Bedford Main Line stations for the diesel and electric alternatives, respectively. Figure 4.9-3 shows the New Bedford microscale air quality study area. As shown in the tables there are minor differences between the diesel and electric alternatives for the microscale (local) analysis. All of the pollutant concentrations for both the diesel and electric alternatives are well below (in compliance with) the NAAQS.

4.9.3.3 Stoughton Electric Alternative

The Stoughton Electric Alternative alignment comprises a portion of the Northeast Corridor, the entire Stoughton line, and the Southern Triangle. This alternative would use the Northeast Corridor only from South Station to Canton Junction. From Canton Junction, the existing Stoughton Line would be used to the Stoughton Station. From there, commuter rail service would be extended, reconstructing a railroad on an out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton. This alignment joins the New Bedford Main Line at Weir Junction, the northern end of the Southern Triangle. This evaluation focuses on the existing and extended Stoughton Line segment.

The existing Stoughton Line commuter rail track from Canton Junction to Stoughton Station would be upgraded to FRA Class 5 for the Stoughton Electric Alternative. New track would be placed on the out-of-service railroad bed from Stoughton Station south to Weir Junction. The existing public at-grade road/railroad crossings would be reconfigured and/or improved to meet current safety standards.

The mesoscale analysis represents travel from South Station to the southern end points in New Bedford and Fall River. The difference in average vehicles miles traveled a day between the No-Build and the Stoughton Electric is approximately a 256,000 reduction with the implementation of the Stoughton Electric Alternative. This VMT reduction results in a reduction in all of the study pollutants as well (except particulate matter), as presented in Table 4.9-8.

Table 4.9-6 Predicted Maximum Pollutant Concentrations, Southern Triangle: New Bedford Main Line- Electric

Town	Station	Intersection	Receptor Location at Intersection	Year 2016 Carbon Monoxide (CO in ppm) 1-hr	8-hr	Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3) 24-hr	Annual	Particulate Matter 10 (PM^{10} in µg/m^3) 24-Hr	Year 2030 Carbon Monoxide (CO in ppm) 1-hr	8-hr	Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3) 24-hr	Annual	Particulate Matter 10 (PM_{10} in µg/m^3) 24-Hour
New Bedford	Whale's Tooth	Union Street at McArthur at Route 18 at State Pier	Northeast	4.1	2.9	30.5	11.9	47.3	4.3	3.0	30.1	11.8	46.9
			Southeast	4.1	2.9	30.5	11.9	47.3	4.6	3.2	30.1	11.8	46.9
			Southwest	4.2	2.9	30.5	11.9	47.3	4.7	3.3	30.5	11.9	47.3
			Northwest	4.5	3.2	30.5	11.9	47.3	4.8	3.4	30.5	11.9	47.3
New Bedford	King's Highway	Church Street at Tarkiln Road	Northeast	3.8	2.7	30.1	11.8	46.9	4.1	2.9	30.1	11.8	46.9
			Southeast	3.7	2.6	30.1	11.8	46.9	4.0	2.8	30.1	11.8	46.5
			Southwest	3.9	2.7	30.1	11.8	46.9	4.0	2.8	30.1	11.8	46.9
			Northwest	3.8	2.7	30.1	11.8	46.9	4.0	2.8	30.1	11.8	46.5

Table 4.9-7 Predicted Maximum Pollutant Concentrations, Southern Triangle: New Bedford Main Line-Diesel

Town	Station	Intersection	Receptor Location at Intersection	Year 2016 Carbon Monoxide (CO in ppm) 1-hr	8-hr	Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3) 24-hr	Ann'l	Particulate Matter 10 (PM_{10} in µg/m^3) 24-hr	Year 2030 Carbon Monoxide (CO in ppm) 1-hr	8-hr	Particulate Matter 2.5 ($PM_{2.5}$ in µg/m^3) 24-hr	Ann'l	Particulate Matter 10 (PM_{10} in µg/m^3) 24-Hour
New Bedford	Whale's Tooth	Union Street at McArthur at Route 18 at State Pier	Northeast	4.1	2.9	30.5	11.9	46.9	4.3	3.0	30.1	11.8	46.9
			Southeast	4.1	2.9	30.5	11.9	47.3	4.6	3.2	30.1	11.8	46.9
			Southwest	4.2	2.9	30.5	11.9	47.3	4.7	3.3	30.1	11.8	47.3
			Northwest	4.5	3.2	30.5	11.9	47.3	4.8	3.4	30.1	11.8	47.3
New Bedford	King's Highway	Church Street at Tarkiln Road	Northeast	4.0	2.8	30.1	11.8	46.9	4.0	2.8	30.1	11.8	46.9
			Southeast	3.8	2.7	30.1	11.8	46.9	3.8	2.7	30.1	11.8	46.5
			Southwest	4.0	2.8	30.1	11.8	46.9	4.0	2.8	30.1	11.8	46.9
			Northwest	3.8	2.7	30.1	11.8	46.9	3.8	2.7	30.1	11.8	46.5

Table 4.9-8 Mesoscale Mobile Source Analysis Results, Stoughton Electric Alternative

Stoughton Electric	Units	2035 No-Build	2035 Build	Build/No-Build Difference
Vehicle Miles Traveled (VMT)[1]	Average Miles/day	118,897,192	118,641,260	-255,932
Volatile Organic Compounds (VOCs)	Kg/day	22,200	22,160	-40
Nitrogen Oxides (NO_x)	Kg/day	19,256	19,159	-98
Particulate Matter 10 (PM_{10})	Kg/day	3,240	3,240	0
Particulate Matter 2.5 ($PM_{2.5}$)	Kg/day	1,490	1,490	0
Carbon Monoxide (CO: Winter)	Kg/day	1,050,356	1,048,074	-2,281
Carbon Dioxide (CO_2)[1]	Tons/year	24,717,339	24,656,479	-60,859

1 The CO_2 was calculated assuming an annualization factor of 365 days/year and 1000kg/1 ton.

As discussed in the methodology section, the intersections that were analyzed as part of the microscale analysis are representative of the air quality impacts within the study areas surrounding the proposed train stations. Table 4.9-9 presents a summary of the results of the microscale air quality analysis for the stations associated with the Stoughton Electric Alternative. Figures 4.9-5, 4.9-6 and 4.9-7 show the microscale study areas for the Stoughton Electric Alternative. The highest CO, $PM_{2.5}$ and PM_{10} concentrations and its receptor locations are presented in Table 4.9-9. These values represent the highest concentrations for each intersection. As shown in the table, all of the pollutant concentrations at the receptors for each of the five study intersections analyzed for the Stoughton Electric Alternative are well below (in compliance with) the NAAQS. As indicated in Section 4.9.2, the study intersections presented in Table 4.9-9 represent the intersections that would incur the greatest impact from the train stations and rail lines associated with the Stoughton Electric Alternative. Since the emissions at these intersections, which represent the worst case scenario (i.e. highest volumes and delays), are well below the NAAQS standards it is expected that the remainder of the study area for the Stoughton Electric Alternative would also fall below (in compliance with) the NAAQS.

Table 4.9-9 Predicted Maximum Pollutant Concentrations, Stoughton Electric Alternative

Town	Station	Intersection	Receptor Location	2016 CO (ppm) 1-Hr	2016 CO (ppm) 8-Hr	2016 $PM_{2.5}$ ($\mu g/m^3$) 24-Hr	2016 $PM_{2.5}$ ($\mu g/m^3$) Annual	2016 PM_{10} ($\mu g/m^3$) 24-Hr	2030 CO (ppm) 1-Hr	2030 CO (ppm) 8-Hr	2030 $PM_{2.5}$ ($\mu g/m^3$) 24-Hr	2030 $PM_{2.5}$ ($\mu g/m^3$) Annual	2030 PM_{10} ($\mu g/m^3$) 24-Hr
North Easton	North Easton	Route 138 at Main Street	Northeast	4.5	3.2	30.5	11.9	47.3	4.5	3.2	30.5	11.9	47.3
			Southeast	4.5	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
			Southwest	4.7	3.3	30.9	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			Northwest	4.6	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
Easton	Easton Village	Route 138 at Main Street	Northeast	4.5	3.2	30.5	11.9	47.3	4.5	3.2	30.5	11.9	47.3
			Southeast	4.5	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
			Southwest	4.7	3.3	30.9	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			Northwest	4.6	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
Raynham	Raynham Park	Route 138 at Foundry Street/Route 106	Northeast	4.2	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	47.3
			Southeast	4.0	2.8	30.5	11.9	47.3	4.0	2.8	30.5	11.9	46.9
			Southwest	4.1	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	46.9
			Northwest	4.0	2.8	30.5	11.9	47.3	4.0	2.8	30.5	11.9	46.9
Taunton	Dean Street	Route 44 at Longmeadow Road	Northeast	4.7	3.3	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
			Southeast	4.4	3.1	30.5	11.9	47.7	4.4	3.1	30.5	11.9	47.3
			Southwest	4.8	3.4	30.9	11.9	48.1	4.8	3.4	30.5	11.9	47.7
			Northwest	4.6	3.2	30.9	11.9	47.7	4.6	3.2	30.5	11.9	32.7
East Taunton	Taunton Depot	Route 140 at the Route 24 Southbound Ramps	East	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	47.7
			Southeast	4.4	3.1	30.5	11.9	47.7	4.4	3.1	30.5	11.9	47.7
			Northwest	4.5	3.2	30.5	11.9	47.7	4.5	3.2	30.5	11.9	47.7
Stoughton	Stoughton	Brock St./Kinsley St. at Washington St.	Northeast	3.7	2.6	22.7	9.9	40.5	3.7	2.6	22.7	9.9	40.5
			Southeast	3.6	2.5	22.7	9.9	40.5	3.6	2.5	22.7	9.9	40.5
			Southwest	3.6	2.5	22.7	9.9	40.5	3.6	2.5	22.7	9.9	40.5
			Northwest	3.6	2.5	22.7	9.9	40.5	3.6	2.5	22.7	9.9	40.5

4.9.3.4 Stoughton Diesel Alternative

The Stoughton Diesel Alternative is identical to the Stoughton Electric Alternative with the exception of the locomotive power source. Table 4.9-10 presents a summary of the mesoscale (regional) analysis for the Stoughton Diesel Alternative. Similar to the Stoughton Electric, the mesoscale analysis represents travel from South Station to the southern end points of New Bedford and Fall River. The estimated reduction in average number of vehicle miles traveled per day is approximately 240,000 with the implementation of the Stoughton Diesel Alternative. The estimated reduction in VMT as well as the reductions in the concentrations of pollutants is greater with the electric alternative (approximately 16,000 more). This is partially due to the greater estimated time savings experienced with the electric alternative over the diesel alternative. This time savings makes the electric alternative more attractive and thus shifts more people onto the train and out of motor vehicles. This results in greater reduction in VMT and associated air pollutants for the electric alternative compared to diesel.

Table 4.9-10 Mesoscale Mobile Source Analysis Results, Stoughton Diesel Alternative

	Units	2030 No-Build	2030 Build	Build/No-Build Difference
Vehicle Miles Traveled (VMT)[1]	Average Miles/day	118,897,192	118,656,844	-240,348
Volatile Organic Compounds (VOCs)	Kg/day	22,200	22,160	-40
Nitrogen Oxides (NO_x)	Kg/day	19,256	19,210	-46
Particulate Matter 10 (PM_{10})	Kg/day	3,240	3,241	1
Particulate Matter 2.5 ($PM_{2.5}$)	Kg/day	1,490	1,491	1
Carbon Monoxide (CO: Winter)	Kg/day	1,050,356	1,048,400	-1,956
Carbon Dioxide (CO_2)[1]	Tons/year	24,717,339	24,688,173	-29,166

1 The CO_2 was calculated assuming an annualization factor of 365 days/year and 1000kg/1 ton.

Table 4.9-11 summarizes the microscale (local) analysis results for the Stoughton Diesel Alternative. The microscale analysis for Stoughton Diesel Alternative also takes into account the emissions from the trains at the study receptors in the vicinity of the study intersections. Even with the train emissions taken into account, all pollutant concentrations under the Stoughton Diesel Alternative are well below (in compliance with) the NAAQS.

Table 4.9-11 Predicted Maximum Pollutant Concentrations, Stoughton Diesel Alternative

Town	Station	Intersection	Receptor Location at Intersection	2016 Carbon Monoxide (CO in ppm) 1-Hr	2016 Carbon Monoxide (CO in ppm) 8-Hr	2016 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m³) 24-Hr	2016 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m³) Ann'l	2016 Particulate Matter 10 (PM_{10} in μg/m³) 24-Hr	2030 Carbon Monoxide (CO in ppm) 1-Hr	2030 Carbon Monoxide (CO in ppm) 8-Hr	2030 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m³) 24-Hr	2030 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m³) Ann'l	2030 Particulate Matter 10 (PM_{10} in μg/m³) 24-Hr
North Easton	North Easton	Route 138 at Main Street	Northeast	4.5	3.2	30.5	11.9	47.3	4.5	3.2	30.5	11.9	47.3
			Southeast	4.5	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
			Southwest	4.7	3.3	30.9	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			Northwest	4.6	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
Easton	Easton Village	Route 138 at Main Street	Northeast	4.5	3.2	30.5	11.9	47.3	4.5	3.2	30.5	11.9	47.3
			Southeast	4.5	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
			Southwest	4.7	3.3	30.9	11.9	47.7	4.7	3.3	30.5	11.9	47.3
			Northwest	4.6	3.2	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
Raynham	Raynham Park	Route 138 at Foundry Street/Route 106	Northeast	4.2	2.9	30.5	11.9	47.3	4.1	2.9	30.5	11.9	47.3
			Southeast	4.0	2.8	30.5	11.9	47.3	4.0	2.8	30.5	11.9	46.9
			Southwest	4.1	2.8	30.5	11.9	47.3	4.1	2.9	30.5	11.9	46.9
			Northwest	4.0	2.8	30.5	11.9	47.3	4.0	2.8	30.5	11.9	46.9
Taunton	Dean Street	Route 44 at Longmeadow Road	Northeast	4.7	3.3	30.5	11.9	47.7	4.6	3.2	30.5	11.9	47.3
			Southeast	4.4	3.1	30.5	11.9	47.7	4.4	3.1	30.5	11.9	47.3
			Southwest	4.8	3.4	30.9	11.9	48.1	4.8	3.4	30.5	11.9	47.7
			Northwest	4.6	3.2	30.9	11.9	47.7	4.6	3.2	30.5	11.9	47.7
East Taunton	Taunton Depot	Route 140 at the Route 24 Southbound Ramps	East	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	49.3
			Southeast	4.4	3.1	30.5	11.9	47.7	4.4	3.1	30.5	11.9	49.3
			Northwest	4.5	3.2	30.5	11.9	47.7	4.5	3.2	30.5	11.9	49.7

4.9.3.5 Whittenton Electric Alternative

The Whittenton Electric Alternative is a variant of the Stoughton Electric Alternative alignment described in Section 4.9.3.3. At Raynham Junction, the route would divert to the southwest, following the out-of-service Whittenton Branch. This alignment would connect with the Attleboro Secondary at Whittenton Junction in Taunton, and then continue on toward the southeast to connect with the New Bedford Main Line at Weir Junction. The southernmost portion of the Stoughton Line (from Raynham Junction to Weir Junction) and the northwestern-most portion of the Attleboro Secondary (from the Attleboro Bypass to Whittenton Junction), would not be used if this alternative is selected. This evaluation focuses on the Whittenton Branch component.

Table 4.9-12 presents a summary of the mesoscale (regional) analysis for the Whittenton Electric Alternative. The mesoscale analysis represents travel from South Station all the way to the southern end points of Whale's Tooth and Battleship Cove. The difference in VMT between the No-Build and the Whittenton Electric Alternative is an approximately 201,000 reduction with the implementation of the Whittenton Electric Alternative. This VMT reduction results in a reduction in emissions of the analyzed pollutants as well.

Table 4.9-13 summarizes the microscale (local) analysis results for the Whittenton Electric Alternative stations. As shown in the table, under the Whittenton Electric Alternative all of the pollutant concentrations are well below (in compliance with) the NAAQS.

Table 4.9-12 Mesoscale Mobile Source Analysis Results, Whittenton Electric Alternative

	Units	2030 No-Build	2030 Build	Build/No-Build Difference
Vehicle Miles Traveled (VMT)[1]	Average Miles/day	118,897,192	118,695,960	-201,232
Volatile Organic Compounds (VOCs)	Kg/day	22,200	22,170	-30
Nitrogen Oxides (NO_x)	Kg/day	19,256	19,169	-88
Particulate Matter 10 (PM_{10})	Kg/day	3,240	3,240	0
Particulate Matter 2.5 ($PM_{2.5}$)	Kg/day	1,490	1,490	0
Carbon Monoxide (CO: Winter)	Kg/day	1,050,356	1,048,554	-1,801
Carbon Dioxide (CO_2)[1]	Tons/year	24,717,339	24,667,849	-49,490

1 The CO_2 was calculated assuming an annualization factor of 365 days/year and 1000kg/1 ton.

4.9.3.6 Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. Table 4.9-14 presents a summary of the mesoscale (regional) analysis for the Whittenton Diesel Alternative. Similar to the previous alternatives, the mesoscale analysis represents travel from South Station to the southern end points of New Bedford and Fall River. The estimated reduction in average number of VMT per day is approximately 186,000 with the implementation of the Whittenton Diesel Alternative. The estimated reduction in VMT as well as the reductions in the concentrations of pollutants is greater with the electric alternative (approximately

15,000 more). This is partially due to the greater estimated time savings experienced with the electric alternative over the diesel alternative. This time savings makes the electric alternative more attractive and thus shifts more people onto the train and out of motor vehicles. This results in greater reduction in VMT and associated air pollutants for the electric alternative compared to diesel.

Table 4.9-15 summarizes the microscale (local) analysis results for the Whittenton Diesel Alternative stations. Similar to the previous diesel alternative, the microscale analysis for the Whittenton Diesel Alternative also takes into account the emissions from the trains at the study receptors in the vicinity of the study intersections. Even with the train emissions taken into account, under the Whittenton Diesel Alternative all pollutant concentrations are well below (in compliance with) the NAAQS.

Table 4.9-13 Predicted Maximum Pollutant Concentrations, Whittenton Electric Alternative

Town	Station	Intersection	Receptor Location at Intersection	2016 Carbon Monoxide (CO in ppm) 1-Hr	2016 Carbon Monoxide (CO in ppm) 8-Hr	2016 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m^3) 24-Hr	2016 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m^3) Ann'l	2016 Particulate Matter 10 (PM_{10} in μg/m^3) 24-Hr	2030 Carbon Monoxide (CO in ppm) 1-Hr	2030 Carbon Monoxide (CO in ppm) 8-Hr	2030 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m^3) 24-Hr	2030 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m^3) Ann'l	2030 Particulate Matter 10 (PM_{10} in μg/m^3) 24-Hr
Taunton	Taunton Depot	Route 140 at the Route 24 Northbound without Slip Ramp	Northeast	4.8	3.4	30.9	11.9	48.5	4.9	3.4	30.9	11.9	48.1
			South	4.9	3.4	30.9	12.0	48.5	4.9	3.4	30.9	11.9	48.1
			Northwest	4.7	3.3	30.9	11.9	48.1	4.8	3.3	30.9	11.9	48.1
Taunton	Dana Street	Washington Street at Tremont Street	Northeast	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	46.9
			Southeast	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	47.3
			Southwest	4.0	2.8	30.5	11.9	46.9	4.0	2.8	30.5	11.9	46.9
			Northwest	4.3	3.0	30.5	11.9	47.3	4.3	3.0	30.5	11.9	47.3
East Taunton	Taunton Depot	Route 140 at the Route 24 Southbound Ramps	East	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	47.3
			Southeast	4.4	3.1	30.5	11.9	47.7	4.4	3.1	30.5	11.9	47.3
			Northwest	4.5	3.2	30.5	11.9	47.7	4.5	3.2	30.5	11.9	47.3

Table 4.9-14 Mesoscale Mobile Source Analysis Results, Whittenton Diesel Alternative

Whittenton Diesel	Units	2030 No-Build	2030 Build	Build/No-Build Difference
Vehicle Miles Traveled (VMT)[1]	Average Miles/day	118,897,192	118,710,886	-186,306
Volatile Organic Compounds (VOCs)	Kg/day	22,200	22,170	-30
Nitrogen Oxides (NO_x)	Kg/day	19,256	19,227	-29
Particulate Matter 10 (PM_{10})	Kg/day	3,240	3,241	1
Particulate Matter 2.5 ($PM_{2.5}$)	Kg/day	1,490	1,491	1
Carbon Monoxide (CO: Winter)	Kg/day	1,050,356	1,048,908	-1,448
Carbon Dioxide (CO_2)[1]	Tons/year	24,717,339	24,703,175	-14,164

1 The CO_2 was calculated assuming an annualization factor of 365 days/year and 1000kg/1 ton.

Table 4.9-15 Predicted Maximum Pollutant Concentrations, Whittenton Diesel Alternative

Town	Station	Intersection	Receptor Location at Intersection	2016 Carbon Monoxide (CO in ppm) 1-Hr	2016 Carbon Monoxide (CO in ppm) 8-Hr	2016 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m3) 24-Hr	2016 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m3) Annual	2016 Particulate Matter 10 (PM10 in μg/m3) 24-Hr	2030 Carbon Monoxide (CO in ppm) 1-Hr	2030 Carbon Monoxide (CO in ppm) 8-Hr	2030 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m3) 24-Hr	2030 Particulate Matter 2.5 ($PM_{2.5}$ in μg/m3) Annual	2030 Particulate Matter 10 (PM10 in μg/m3) 24-Hr
Taunton	Taunton Depot	Route 140 at the Route 24 Northbound without Slip Ramp	Northeast	4.8	3.4	30.9	11.9	48.1	4.8	3.4	30.9	11.9	48.1
			South	4.9	3.4	30.9	11.9	48.5	4.9	3.4	30.9	11.9	48.1
			Northwest	4.6	3.2	30.9	11.9	48.1	4.7	3.3	30.9	11.9	48.1
Taunton	Dana Street	Washington Street at Tremont Street	Northeast	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	46.9
			Southeast	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	47.3
			Southwest	4.0	2.8	30.5	11.9	46.9	4.0	2.8	30.5	11.9	46.9
			Northwest	4.3	3.0	30.5	11.9	47.3	4.3	3.0	30.5	11.9	47.3
East Taunton	Taunton Depot	Route 140 at the Route 24 Southbound Ramps	East	4.2	2.9	30.5	11.9	47.3	4.2	2.9	30.5	11.9	49.3
			Southeast	4.4	3.1	30.5	11.9	47.7	4.4	3.1	30.5	11.9	49.3
			Northwest	4.5	3.2	30.5	11.9	47.7	4.5	3.2	30.5	11.9	49.7

4.9.3.7 Stations

This section evaluates the potential air quality impacts of train locomotive emissions on receptor locations adjacent to the train stations. A stationary source analysis was not conducted for the train stations because there are no buildings proposed as part of the stations for the South Coast Rail project. The stations would only include a platform. There are some electrical requirements for each station but the emissions related to the minimal electrical requirements are considered negligible. The air quality analysis evaluated the potential for impact of train locomotives on residential receptor locations adjacent to the train stations by calculating the worst-case pollutant concentrations and the distance from the train stations that they would occur. The trains that would be used on the South Coast Rail alternatives could be electric or diesel. The electric trains do not emit air pollutants and would not have any air quality impacts on receptor locations adjacent to the train stations. An analysis of the impacts of the diesel commuter rail trains on the closest residential area adjacent to the train stations was conducted using USEPA's AERMOD air dispersion model. The primary pollutants of concern from diesel trains are CO, NO_x, PM_{10}, and $PM_{2.5}$. AERMOD calculated the highest concentrations of each pollutant and the distances from the train station that they would occur. These results represent a worst-case condition.

The result of the air quality analysis demonstrates that all of the pollutant concentrations would be below the NAAQS. Receptor locations that are located further away from the train stations would experience lower pollutant concentrations due to additional dilution with greater distances. The worst-case modeling results, distances from the train stations, background, project contributions, and total concentration values are presented in Table 4.9-16. The air quality analysis represents a worst-case condition because it was conducted for 2016. While train emissions do not change frequently, it is reasonable to assume that by 2030 the train emissions and pollutant concentrations presented in Table 4.9-16 would be lower. It should be noted that the pollutant increases from train locomotives are relatively small.

Table 4.9-16 2016 Station Concentrations ($\mu g/m^3$)

Pollutant	Averaging Time	NAAQS (ug/m^3)	Distance from Emission Source (ft)	Background Concentrations (ug/m^3)	Project Contribution (ug/m^3)	Maximum Concentrations (ug/m^3)
CO	1-Hour	40,000	164	3,428.6[1]	367.0	3,795.6
	8-hour	10,000	328	2,400.0[2]	206.5	2,606.5
NO_x	Annual	100	492	44.8	1.1	45.9
PM_{10}	24-Hour	150	328	45.7	0.7	46.4
$PM_{2.5}$	24-Hour	35	328	29.7	0.7	30.4
	Annual	15	492	11.7	0.0	11.7

1 1-hr CO background concentration 3.0 ppm = 3,428.6 ug/m^3
2 8-hr CO background concentration 2.1 ppm = 2,400.1 ug/m^3

4.9.3.8 Layover Facilities

This section evaluates the potential air quality impacts of train locomotive emissions on receptor locations adjacent to the layover facilities. The layover facilities would be open air storage areas for the trains. There are some electrical requirements for each layover facility but the emissions related to the minimal electrical requirements are considered negligible. The air quality analysis evaluated the potential for impact of train locomotives on residential receptor locations adjacent to the layover

facilities by calculating the worst-case pollutant concentrations and the distance from the train stations that they would occur. The trains that would be used on the South Coast Rail alternatives could be electric or diesel. Electric trains do not emit air pollutants and would not have any air quality impacts on receptor locations adjacent to the layover facilities. An analysis of the impacts of the diesel commuter rail trains on the closest residential area adjacent to the layover facilities was conducted using USEPA's AERMOD air dispersion model. The primary pollutants of concern from diesel trains are CO, NO_x, PM_{10}, and $PM_{2.5}$. AERMOD calculated the highest concentrations of each pollutant and the distances from the layover facility that they would occur. These results represent a worst-case condition for both the Wamsutta and Weaver's Cove East layover facilities.

The result of the air quality analysis demonstrates that all of the pollutant concentrations would be below (in compliance with) the NAAQS. Receptor locations that are located further away from the layover facilities would experience lower pollutant concentrations due to additional dilution with greater distances. The worst-case modeling results, distances from the layover facilities, background, project contributions, and total concentration values are presented in Table 4.9-17. It should be noted that the pollutant increases from train locomotives are small. Under the Stoughton Diesel or Whittenton Diesel Alternatives, plug-ins and electric block heaters would be used at the rail layover facilities to minimize criteria pollutant emissions.

Table 4.9-17 2016 Layover Concentrations (μg/m³)

Pollutant	Averaging Time	NAAQS (ug/m³)	Distance from Emission Source (ft)	Background Concentrations (ug/m³)	Project Contribution (ug/m³)	Maximum Concentrations (ug/m³)
CO	1-Hour	40,000	164	3,428.6	734.0	4,162.6
	8-hour	10,000	328	2,400.0	413.1	2,813.1
NO_x	Annual	100	492	44.8	2.2	47.0
PM_{10}	24-Hour	150	328	45.7	1.3	47.0
$PM_{2.5}$	24-Hour	35	328	29.7	1.3	31.0
	Annual	15	492	11.7	0.1	11.8

The air quality analysis also calculated the potential GHG emissions from the layover facilities. The GHG emissions are the dominant emission source from diesel trains using electric plug-ins to keep the engines warm on winter nights. For analysis purposes it was assumed that the layover facilities at New Bedford and Fall River can store up to a total of 7 trains combined. The yearly electric consumption for the trains stored at the layover facilities was estimated in kilowatt hours and converted to CO_2 emissions. The results are presented in Table 4.9-18. Train activity at the two layover facilities would result in 1,272 tons of CO_2 emission per year.

Table 4.9-18 Estimated CO_2 Emissions at the Proposed Layover Facilities

	Hours/day	Number of Trains	Kwh	Mwh	Tons of CO_2/year
Layover Facilities	6	7	258	0.258	1,272

4.9.3.9 Analysis of Locomotive Emissions on Adjacent Receptors

This section evaluates the potential air quality impacts of train locomotive emissions on receptor locations adjacent to the train tracks. The air quality analysis evaluated the potential for impact of train

locomotives on adjacent residential receptor locations by calculating the worst-case pollutant concentrations and the distance from the train track that they would occur. The trains that would be used on the South Coast Rail alternatives could be electric or diesel. The electric trains do not emit air pollutants and would not have any air quality impacts on receptor locations adjacent to the train tracks. An analysis of the impacts of the diesel commuter rail trains on the closest residential area adjacent to the train tracks was conducted using USEPA's AERMOD air dispersion model. The primary pollutants of concern from diesel trains are CO, NO_x, PM_{10}, and $PM_{2.5}$. AERMOD calculated the highest concentrations of each pollutant and the distances from the train tracks over which they would occur. These results represent a worst-case condition.

The results of the air quality analysis demonstrate that all of the pollutant concentrations would be below (in compliance with) the NAAQS. Receptor locations that are located further away would experience lower pollutant concentrations due to additional dilution with greater distances. The worst-case modeling results, distances from the train tracks, background, project contributions, and total concentration values are presented in Table 4.9-19. The emissions from train locomotives initially rise above the train engine due to the high exit temperatures and flow rate out of the exhaust. The emissions are subsequently carried away from the train track and gradually fall to the ground. The air quality analysis calculated the pollutant concentrations at various distances from source and sorted for the highest concentrations at the location that it would occur. Pollutant concentrations closer to the train tracks would be lower or zero depending upon the initial exhaust plume rise and rate that the train locomotive emissions fall to the ground. It should be noted that the pollutant concentration increases from train locomotives emissions are very small. These increases represent 1.5 percent or less of the worst-case total concentrations and would not result in any air quality impacts on receptor locations adjacent to the train tracks.

Table 4.9-19 2016 Train Track Concentrations (µg/m^3)

Pollutant	Averaging Time	NAAQS (ug/m^3)	Distance from Emission Source (ft)	Background Concentrations (ug/m^3)	Project Contribution (ug/m^3)	Maximum Concentratio ns (ug/m^3)
CO	1-Hour	40,000	164	3,428.6	7.65	3,436.25
	8-hour	10,000	328	2,400.0	4.30	2,404.30
NO_x	Annual	100	492	44.8	0.56	45.36
PM_{10}	24-Hour	150	328	45.7	0.33	46.03
$PM_{2.5}$	24-Hour	35	328	29.7	0.33	30.03
	Annual	15	492	11.7	0.01	11.71

4.9.3.10 Microscale Sensitive Area Analysis

This section evaluates the potential for aerial deposition of oxides of nitrogen (NO_X) from train-generated emissions on environmentally sensitive areas (such as the Hockomock Swamp and other wetlands adjacent to the train tracks). The air quality analysis evaluated the potential for impact of train locomotives on adjacent environmentally sensitive areas by calculating the worst-case pollutant concentrations and the distance from the train track that they would occur. The primary pollutant of concern from diesel trains passing through these environmentally sensitive areas is oxides of nitrogen (NO_X). USEPA's AERMOD air dispersion model was used calculate the worst-case concentrations of NO_X.

The air quality analysis demonstrates that the aerial deposition of train-generated emissions is not a

substantial source of pollution of water resources (wetlands) because of the very low concentrations of pollutants in the vicinity of the train track. The NAAQS annual arithmetic mean of NO_X is 100 $\mu g/m^3$. The air quality analysis calculated a worst-case concentration of NO_X 45.8 $\mu g/m^3$ at a distance of 500. The background component is 44.8 $\mu g/m^3$ and the project contribution is 1.0 $\mu g/m^3$. The pollutant increases from train locomotives are very small. These increases represent 2 percent or less of the worst-case total concentrations.

The air quality analysis demonstrates that the aerial deposition of train-generated emissions is not a significant source of pollution of water resources because of the very low concentrations of pollutants in the vicinity of the track. The train-generated emissions would be lower at distances further away from the train tracks and would be reduced in the future with the use of cleaner fuels. The electric trains would have no appreciable air quality impact on environmentally sensitive receptors, such as the Hockomock Swamp and other wetlands, since they do not emit any NO_X.

4.9.4 Temporary Construction–Period Impacts

4.9.4.1 Construction Activities

Temporary air quality impacts could result from construction activities associated with utility relocation, grading, excavation, track work and installation of systems components. Such impacts may occur in residential areas and at other sensitive land uses located within several hundred feet of the alignment. In addition to direct emissions of criteria pollutants and greenhouse gases by construction equipment and construction worker travel, particulate emissions from construction sites can occur due to fugitive dust. Construction best management practices, including dust control measures, outlined in the following section can reduce these impacts and help ensure air quality standards are not exceeded.

4.9.4.2 Construction Mitigation

In an effort to reduce criteria pollutants and GHG emissions from temporary construction activities, construction contractors would be contractually required to adhere to all applicable regulations regarding control of construction vehicles emissions. This would include, but not be limited to, maintenance of all motor vehicles, machinery, and equipment associated with construction activities and proper fitting of equipment with mufflers or other regulatory-required emissions control devices. Also, the prohibition of excessive idling of construction equipment engines would be implemented, as required by MassDEP regulations in 310 CMR 7.11.

Construction specifications would stipulate that all diesel construction equipment used on-site would be fitted with after-engine emission controls such as diesel oxidation catalysts (DOCs) or diesel particulate filters (DPFs).[16] Construction contractors would be required to utilize ultra-low sulfur diesel fuel for all off-road construction vehicles as an additional measure to reduce air emissions from construction activities. Idling restriction signs would be placed on the premises to remind drivers and construction personnel of the State's idling regulation, which requires that the engine must be shut down if the vehicle will be stopped for more than five minutes (310 CMR 7.11(1)(b)).[17]

The contractor would be required to implement protective measures around the construction and demolition work to protect pedestrians and prevent dust and debris from leaving the site or entering the surrounding community. Dust generated from earthwork and other construction activities like

[16] This is consistent with the Certificate of Construction Equipment Standard Compliance Form required for all bids to the MBTA.
[17] http://www.epa.gov/region1/topics/air/sips/ma/MA_Reg11.pdf

stockpiled soils would be controlled by spraying with water to mitigate wind erosion on open soil areas. Other dust suppression methods would be implemented to ensure minimization of the off-site transport of dust. Regular sweeping of the pavement of adjacent roadway surfaces would be required during the construction period to minimize the potential for vehicular traffic to create airborne dust and particulate matter.

4.9.5 Summary of Impacts by Alternative

All alternatives comply with the Clean Air Act Amendments (CAAA) and the Executive Office of Energy and Environmental Affairs (EEA) policy on Greenhouse Gas emissions. The ozone mesoscale analysis demonstrated that the Build Alternatives would result in a decrease of VOC and NO_X emissions, as compared to the No-Build Alternative.

The alternatives would incorporate reasonable and feasible mitigation measures (as described in Chapter 4.1, *Transportation*) to reduce CO_2 and greenhouse gas (GHG) emissions consistent with DEP guidelines. All Build Alternatives meet the EEA policy on GHG emissions because they include mobile and stationary source mitigation measures that would reduce the GHG emission from levels expected from a project without mitigation.

The air quality study demonstrates that all alternatives conform to the CAAA and to the EEA GHG policy because:

- They would implement reasonable and feasible emission reduction mitigation measures.
- No new violation of the NAAQS would be created.
- No increase in the frequency or severity of any existing violations would occur.
- No delay in attainment of any NAAQS would result.

The following provides a summary of the air quality impacts of each of the South Coast Rail alternatives.

4.9.5.1 Mesoscale Analysis Results

The air quality study included a mesoscale analysis that estimates the area wide emissions of VOCs, NO_X, CO_2, CO, and PM emissions. The mesoscale analysis evaluated the changes in emissions based upon changes in the average daily traffic volumes, roadway lengths, and vehicle emission rates. To demonstrate compliance with the USEPA criteria, the air quality study must show the proposed South Coast Rail project's change in daily (24-hour period) VOC and NO_X emissions. Using USEPA recommended air quality modeling techniques, total pollutant emissions were calculated for the No-Build Alternative and the Build Alternatives. The mesoscale analysis calculated the 2035 mobile source emissions from the major roadways in the study area as well as train emissions.

The No-Build Alternative VOC and NO_X emissions are typically lower than the Existing Conditions emissions due to the implementation of state and federal emission control programs, such as the Federal Motor Vehicle Emission Control Program, the Stage II Vapor Recovery System, and the Massachusetts Inspection and Maintenance program. Table 4.9-20 presents the mesoscale analysis results for all the alternatives.

All Build Alternatives would reduce emissions of $NO_{X,}$, CO, and CO_2, in comparison to the No-Build

Alternative (See Table 4.9-20). All of the Build Alternatives have a negligible effect on particulate matter emissions. The electric alternatives all have lower emissions than the corresponding diesel alternative for all of the pollutants. The difference between the diesel and electric is most notable with the NO_X emissions where the emissions for the electric alternative are substantially less than the corresponding diesel alternative. This is due to the higher NO_X output related to the locomotives burning diesel fuel. The Stoughton Electric Alternative generally results in the greatest reduction in emissions which is consistent with the estimated highest reduction in VMT.

Transit Emissions

Feeder Bus System

A review of the feeder bus system that could be provided with the Stoughton Electric and Whittenton Electric Alternatives was conducted. Three regional transit authorities, Brockton Area Transit Authority (BAT), SRTA, and GATRA currently provide local bus service to the SCR corridor. Most of the feeder bus routes that would serve each of the proposed stations are diversions of existing routes. Based on this, it is anticipated that the feeder buses would further reduce greenhouse measures because the overall greenhouse emissions of the bus diversions would be outweighed by the VMT saving of the riders of the feeder bus system. This GHG savings, however, would be negligible compared to the overall GHG savings realized by the proposed Stoughton Electric or Whittenton Electric Alternatives. Because most of the feeder buses would be diversions of existing routes (adding approximately 22.5 miles for all the routes serving the South Coast Rail stations), it is not anticipated that a new fleet would be required to provide the feeder bus system. The existing fleet would be commissioned. It is likely that as the fleets of the various transit providers that provide feeder buses to the stations are replaced, alternative fuels would be considered for replacement.

Transit Vehicles

In addition to the assessment of auto and truck emissions related to the South Coast Rail project, the emissions related to transit systems within the study area for the No-Build Alternative, the Stoughton Electric and Whittenton Electric Alternatives were evaluated and are included in the totals shown in Table 4.9-20. The emissions savings of the replacement of the transit vehicles (No-Build TSM option) with the proposed South Coast Rail electric trains are minimal compared to the overall project emission savings (savings from the reduced VMT). The transit vehicle emission savings are the same for Stoughton and Whittenton Electric Alternatives. The transit VMT is expected to be reduced by 3,700 transit vehicles per day with replacing the transit vehicles with the electric rail which is 0.003 percent of the overall VMT for the study alternatives. This VMT equates to a savings of 6 kg/day of CO, 42 kg/day of NO_x, and 2,800 tons per year of CO_2.

Table 4.9-20 Summary of the 2035 Mesoscale (Regional) Air Quality Analysis for the South Coast Rail Alternatives

		Vehicle Miles Traveled (VMT)[1]	Volatile Organic Compound (VOC) (kg/day)	Oxides of Nitrogen (NO_x) (kg/day)	Particulate Matter 10 (PM_{10}) (kg/day)	Particulate Matter 2.5 ($PM_{2.5}$) (kg/day)	Carbon Monoxide (CO-Winter) (kg/day)	Carbon Dioxide (CO_2) (tons/year)
No-Build	Total	118,897,192	22,200	19,256	3,240	1,490	1,050,356	24,717,339
Stoughton Electric	Total	118,641,260	22,160	19,159	3,240	1,490	1,048,074	24,656,479
	Difference from No-Build	-255,932	-40	-98	0	0	-2,281	-60,859
Stoughton Diesel	Total	118,656,844	22,160	19,210	3,241	1,491	1,048,400	24,688,173
	Difference from No-Build	-240,348	-40	-46	1	1	-1,956	-29,166
Whittenton Electric	Total	118,695,960	22,170	19,169	3,240	1,490	1,048,554	24,667,849
	Difference from No-Build	-201,232	-30	-88	0	0	-1,801	-49,490
Whittenton Diesel	Total	118,710,886	22,170	19,227	3,241	1,491	1,048,908	24,703,175
	Difference from No-Build	-186,306	-30	-29	1	1	-1,448	-14,164

1 VMT represents the vehicle miles traveled on an average weekday in 2035.
2 The Build Alternatives used for the air quality analysis include the physical and operational mitigation proposed to improve traffic operations (as outlined in Chapter 4.1, *Transportation*).
Note: Includes transit-related emissions changes (bus and rail).

4.9.5.2 Microscale Analysis Results

The air quality analysis evaluated the potential for impact of motor vehicles and train locomotives on hotspot locations around stations. Hotspot locations are typically congested intersections. USEPA guidelines require that the project intersections be ranked by their level-of-service and their total traffic volumes and that the air quality analysis model the highest three intersection in each ranking. The intersections in the study area were ranked based on traffic volumes and level of service. In order to ensure adequate coverage of the study area, additional intersections were added, one for each station site that would be impacted by station-related traffic. The microscale analysis included motor vehicle and train emissions to calculate worst-case concentrations.

The trains that would be used on the Build Alternatives could be electric or diesel. The electric trains do not emit air pollutants and would not have any contribution to air quality impacts on receptor locations around the stations. The microscale analysis, which typically focuses on motor vehicle emissions, added the emissions of the diesel commuter rail trains to the intersection receptor locations to calculate the highest concentrations of CO, PM_{10}, and $PM_{2.5}$. The results represent a worst-case condition. All of the pollutant concentrations are below (in compliance with) the NAAQS. The Build Alternatives would not substantially change any of the concentrations of CO, PM_{10}, and $PM_{2.5}$. All of the increases are less than 1ppm for CO and less than 0.3 $\mu g/m^3$ for PM_{10} and $PM_{2.5}$.

The results demonstrate that all alternatives would meet the NAAQS for CO, PM_{10}, and $PM_{2.5}$. The worst-case modeling results are presented in the tables in Section 4.9.3. The alternatives would not:

- cause any new violation of the NAAQS;
- increase the frequency or severity of any existing violations; or
- delay attainment of any NAAQS.

4.9.5.3 Greenhouse Gas Emissions

The Executive Office of Energy and Environmental Affairs (EEA) has developed a policy that requires project proponents to identify and describe the feasible measures to minimize GHG emissions. The Policy requires that projects quantify the project's direct and indirect GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. Projects generate GHG emissions through the use of electricity and fossil fuels typically from building sources including boilers, heaters and internal combustion engines. EEA/MEPA's GHG policy requires that the analysis include a no-build, build, and build with improvements conditions. The build condition represents the stationary source emissions that would occur if the proposed Project were to be built using typical construction materials and rooftop equipment that are built to the Massachusetts Building Code. The build with improvements condition should include improved building materials and rooftop equipment, and renewable resources, such as solar, wind, geothermal, green power, and energy star measures.

While the alternatives would help reduce GHG emissions, there would be no buildings associated with the alternatives that would generate GHG emissions. The stations and layover facilities would all be open to the outside and would not need heating/air conditioning equipment. Therefore, the air quality analysis did not evaluate cumulative impacts by alternative, nor did it compare building under the current state building codes to proposed building with mitigation measures. Because no buildings are associated with any of the alternatives, no discussion and consideration of recommendations of the

Massachusetts Zero New Energy Building Task Force was included. In absence of buildings associated with the alternatives the air quality analysis did not include an evaluation of renewable energy sources and commitment to appropriate LEED and Energy Star elements.

The air quality analysis did evaluate the motor vehicle and train locomotive GHG emissions and did discuss a commitment to using train engine plug-ins and electric block heaters at layover facilities. All Build Alternatives represent a GHG mitigation measure because they are all designed to reduce vehicle miles of travel. All Build Alternatives would reduce GHG emissions as compared to the No-Build conditions. The GHG emission results by alternative are presented in Section 4.9.3. A discussion of GHG is also included in Chapter 5.

Indirect Effects

The mobile source CO_2 emissions indirectly resulting from the No-Build Alternative would be 74,676 tons per year (tpy). For the Stoughton Electric Alternative as compared to the No-Build Alternative, mobile source GHG emissions would be reduced as a result of reductions in VMT. The Stoughton Electric Alternative would indirectly result in 74,482 tpy CO_2 emissions, a reduction of 194 tpy. The total indirect changes in GHG emissions from mobile and stationary sources would be an increase of 32, 974 tpy over the No-Build Alternative for the Stoughton Electric Alternative. For the Whittenton Electric Alternative as compared to the No-Build Alternative, mobile source GHG emissions would be reduced as a result of reductions in VMT. The Whittenton Electric Alternative would indirectly result in 74,516 tpy CO_2 emissions, a reduction of 160 tpy. The total indirect changes in GHG emissions from mobile and stationary sources would be an increase of 33,008 tpy over the No-Build Alternative for the Whittenton Electric Alternative.

4.9.5.4 Air Toxics

The air quality study qualitatively evaluated the potential for impact due to air toxics, as required in The Secretary of Environmental Affairs Certificate on the Environmental Notification Form (ENF). Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile sources emit “hazardous air pollutants” or air toxics that can cause cancer and other serious health effects. The Clean Air Act provided an initial list of 188 hazardous air pollutants, 93 of which USEPA has identified as being emitted by mobile sources.[18] The Clean Air Act also required USEPA to conduct research on human health effects of air toxics and prescribed the approach to setting emissions standards and other regulatory requirements to control air toxic emissions. Specific to mobile sources, Section 202(l)(2) of the Clean Air Act requires USEPA to set emission standards to control air toxics from motor vehicles and motor vehicle fuels. Unlike the criteria pollutants for which NAAQS are established, the Clean Air Act did not grant USEPA the authority to establish health-based ambient air quality standards for MSATs. As part of the 2007 Control of Hazardous Air Pollutants from Mobile Sources rule, USEPA identified seven compounds with substantial contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter (POM).

For each alternative, the amount of MSATs emitted would be proportional to the VMT, assuming that

[18] U.S. Environmental Protection Agency. *Final Rule, Control of Hazardous Air Pollutants from Mobile Sources*, 72 F.R. 8427, February 26, 2007.

other variables such as fleet mix are the same for each alternative. The VMT for each alternative are presented above in Table 4.9-20. The VMT estimated for each of the Build Alternatives are lower than that for the No-Build Alternative, because any of the South Coast Rail alternatives would remove vehicles (and therefore reduce VMT) from the study area roadways by shifting mode choice to public transportation (i.e. the South Coast Rail). This reduction in VMT would lead to lower MSAT emissions for the Build Alternatives. The differences in VMT between the various alternatives would result in similar differences in the MSAT emissions.

Based on an FHWA analysis using USEPA's MOVES2010b model even if national VMT increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSAT is projected for the same time period.[19] Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the USEPA projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in all cases.

4.9.6 Regulatory Compliance

4.9.6.1 MassDEP Air Quality Regulations

All of the pollutant concentrations at the receptors for all study intersections analyzed for the Stoughton Electric and Whittenton Electric Alternatives are well below (in compliance with) the MassDEP ambient air quality standards (310 CMR 6.0) for PM10 and CO which follow the USEPA guidelines under 40 CFR part 50. The South Coast Rail project would also follow all MassDEP regulations outlined in 310 CMR 7.0. The project would include the following (but not limited to):

- reduce single occupant commuter vehicle use;
- reduce overall emissions with the reduction of VMT; and
- require implementation of low sulfur fuel use on all construction vehicles.

4.9.6.2 General Conformity

As noted in Section 4.9.1.2, the South Coast Rail project is subject to General Conformity (Title 40 Code of Federal Regulations (CFR) Part 93, Subpart B). General conformity provisions only apply in nonattainment and maintenance areas. The project area is nonattainment for the 8 -hour ozone standard, therefore the relevant pollutants for consideration are the two ozone precursors- VOCs and NO_x. As a regional issue, microscale analysis is not applicable to ozone precursors. The long-term effect of the Stoughton and Whittenton Alternatives on VOC and NO_x emissions is beneficial (e.g. reduced emissions relative to the No-Build Alternative). Therefore, a conformity determination would not be required to address long-term operational emissions, even if such emissions could be practically controlled by the Corps. As discussed in Section 4.9.1.2, long-term operation emissions (such as from diesel locomotives under the diesel Build Alternatives), are not indirect emissions within the scope of General Conformity because the Corps cannot control them and has no continuing program control over the rail line.

However, General Conformity also applies to peak year construction emissions (unlike transportation conformity that exempts consideration of construction emissions if construction activities last less than

[19] http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm

five years in any one location). For the SCR project, construction-related emissions are a reasonably foreseeable consequence of the Corps' Section 404 permit decision. If construction emissions exceed certain de minimis criteria, a General Conformity determination could be required. The de minimis criteria for this project (ozone nonattainment area in an ozone transport region) are as follows:

- VOC- 50 tons/year
- NO_x- 100 tons/year

The construction schedule and staging of the Build Alternatives have not been defined in sufficient detail at this point in the development of the project to quantify construction period VOC and NO_x emissions for comparison to the de minimis criteria. The Corps would require the preparation of a General Conformity applicability analysis for peak construction year emissions of the preferred alternative prior to the NEPA Record of Decision. If the *de minimis* criteria are not exceeded, no further review would be required. If the criteria are exceeded, a General Conformity determination (including 30-day public review period) would be required prior to project implementation.

South Coast Rail Coordination

Ridership and traffic estimates associated with each alternative were developed and calibrated by the Central Transportation Planning Staff (CTPS) using its Regional Travel Demand Model (RTDM). The inputs for the RTDM included land use assumptions, transportation service assumptions, and modeling methods. The RTDM and the subsequent analysis were developed from information provided by and coordinated with various federal, state, regional, and local entities. Many parts of the model used in this analysis were examined and accepted by FTA as part of various New Starts and Environmental Review documents. The State of Rhode Island provided information to CTPS on the Rhode Island RTDM, including land use assumptions, and specific projects such as the TF Green Rail project. CTPS coordinated with the state of Massachusetts to ensure that utilized data was consistent across state agencies such as MassDOT and the MBTA in developing service plans. The Metropolitan Area Planning Council (MAPC), the Old Colony Planning Council (OCPC), and the Southeastern Regional Planning & Economic Development District (SRPEDD) provided information to CTPS as used in their last adopted Regional Long Rang Transportation Plan. This information generally consisted of land use assumptions, transit system details, and highway characteristics; both present and future. Local communities provided CTPS with information regarding details on where the stations would be located, the amount of parking that could be built, as well as other service characteristics. CTPS coordinated with the parties above and others in establishing appropriate planning assumptions for its Regional Travel Demand Model (RTDM).

4.10 PROTECTED OPEN SPACE AND AREAS OF CRITICAL ENVIRONMENTAL CONCERN

4.10.1 Introduction

This chapter describes existing conditions and analyzes potential impacts on protected open space and state-designated ACECs. Although not subject to regulatory jurisdiction, important privately owned conservation lands adjacent to each alternative are also included, where applicable. An overview is presented below of the definition of the resources, their regulatory context and the methodology used to inventory the resources and evaluate potential impacts. Section 4.10.2 identifies the project study area, summarizes regional public or private open space and ACEC resources, and describes the protected public and selected private open space and ACECs along each alternative alignment. Section 4.10.3 identifies the effects to protected open space or designated ACECs that may result from implementing each of the South Coast Rail alternatives, and describes potential mitigation measures that may be implemented to offset direct impacts to protected open spaces and ACECs. A summary of the regulatory programs that address protected open spaces and ACECs is provided in Section 4.10.4.

The Secretary of the EEA issued a certificate on the ENF on April 3, 2009. The certificate included a number of requirements that defined the scope of the DEIR. Specific requirements for protected open spaces and ACECs were:

- "The DEIR should identify ecosystems within each ACEC and conservation area that would be impacted by the various alternatives, and include a quantitative and qualitative analysis of impacts to wetlands and water quality, wildlife habitat, water supply, and floodplain."

- "The DEIR should include a detailed analysis of the proposed disposition [of DCR property in the Blue Hills Reservation], which should include a quantitative and qualitative description of potential land impacts, a map showing the area that would require a disposition, and a demonstration of how the disposition would comply with the EOEEA's Article 97 Land Disposition Policy. The DEIR should include an evaluation of feasible alternatives to the disposition. The DEIR should also identify and describe any other potential impacts to DCR property."

- "The DEIR should include a detailed analysis of the potential impacts of project alternatives on the Hockomock Wildlife Management Area and other protected open space. The DEIR should identify all Article 97 lands that would be impacted by the alternatives, clarify if state or municipality owned, describe potential impacts and, where applicable, discuss consistency with EOEEA's Article 97 Land Disposition Policy."

The Secretary's Certificate on the DEIR, dated June 29, 2011, included the following requirements for the FEIR in regard to open space:

- "*Hockomock Swamp Wildlife Management Area*. The proposed Stoughton route uses an inactive railroad Right-of-Way that crosses through the Hockomock Swamp [Wildlife Management Area]. The FEIR should include a detailed analysis of the project's potential impacts to open space within the Hockomock Swamp, including any impacts relating to infrastructure, such as access roads for construction or ongoing maintenance of the trestle and rail ROW. The FEIR should include a detailed plan to avoid and minimize impacts and/or

to mitigate unavoidable impacts to open space. The FEIR should clarify whether proposed work falls within the existing ROW or to what degree it will extend beyond it."

- "*Taunton Wild and Scenic River*. The FEIR should include an update on consultations with the National Park Service regarding the status of Taunton River as a National Wild and Scenic River, and to discuss issues relating to water quality impacts from construction and stormwater runoff, rail line crossings of the Taunton and its tributaries, impacts to natural and cultural landscape features, selection and siting of layover facilities, and construction of the Fall River Depot station."

- "*Acushnet Cedar Swamp National Natural Landmark*. The FEIR should describe proposed measures to avoid and minimize construction and train operational noise impacts during critical wildlife breeding season in spring and early summer."

- "*Article 97 and other Open Space*. The open space impact estimates presented in the DEIR's summary tables are limited to Article 97 land and are not representative of the full range of potential impacts to open space. The FEIR should quantify all open space impacted by the project and describe mitigation commitments. The FEIR should expand upon the evaluation in the DEIR/S to demonstrate consistency with the EEA Article 97 Land Disposition Policy. MassDOT should consult with the Department of Conservation and Recreation during FEIR preparation to discuss policy requirements and a land disposition agreement."

4.10.1.1 Resource Definition

Protected public open space includes public parks, public conservation areas, public recreation areas, and wildlife refuges owned by a public agency, such as the local or state government. Ballfields, athletic fields, or playgrounds associated with public schools have also been included where such resources are publicly accessible. Private open space preserved for conservation and owned by a non-profit land trust, or other similar entity that is available for public use or benefit is also included in the analysis. Public benefit may include activities for the public, such as educational programs or recreation, and/or ecological services provided by the open space, such as wildlife habitat or vital ecosystems. Privately owned recreational facilities such as golf courses are not included.

ACECs are places in Massachusetts that receive special recognition because of the quality, uniqueness, and significance of their natural and cultural resources. These areas are identified and nominated at the community level and are reviewed and designated by the state's Secretary of Environmental Affairs. Under the state program, ACECs are designated to promote awareness and stewardship of these important natural areas, although developed areas may be included within an ACEC's boundaries. The designation works through the existing state environmental regulatory and review framework and does not change local regulations or zoning.[1] The ACEC program is managed by the Massachusetts Department of Conservation and Recreation (DCR).

4.10.1.2 Regulatory Context

Projects within an ACEC that are subject to state agency jurisdiction or regulation requiring a state permit, or are funded by a state agency, are reviewed with close scrutiny to avoid or minimize adverse environmental impacts.[2] The principal state agencies with regulations referring to ACECs are the

[1] DCR. 2009. ACEC Regulatory Summary. Website http://www.mass.gov/dcr/stewardship/acec/reqsum.htm.
[2] Ibid

Massachusetts Office of Coastal Zone Management (CZM), the MEPA Office, and MassDEP. MEPA regulations require that state agencies study the environmental consequences of their actions, including permitting and financial assistance, and take all feasible measures to avoid, minimize, and mitigate damage to the environment.[3] The proponent of any project (as defined by the MEPA regulations) located within an ACEC must file an ENF for MEPA review, unless the project consists solely of one single-family dwelling. The ENF for the South Coast Rail project was filed in November 2008 and the Secretary of the Executive Office of EEA's Certificate[4] on the ENF requires that an EIR be filed.

Article 97 of the Massachusetts Constitution protects all publicly owned lands used for conservation or recreation purposes. This provision protects lands acquired for natural resources values, meaning "conservation, development and utilization of the agricultural, mineral, forest, water, air, and other natural resources."[5] Before these properties can be sold, transferred, or converted to a different use, the following is required: action by the local Conservation Commission and Parks and Recreation Commission; a two-thirds vote by the municipal government; and a roll call two-thirds vote of the State House of Representatives and Senate.

According to the EEA's Division of Conservation Services, conservation and recreation land within a community is protected (also referred to as "in perpetuity") if it is owned by the local Conservation Commission, a state conservation agency, a nonprofit land trust, or if the municipality received state or federal monies for the improvement or purchase of the land.[6] Private property can also be permanently protected if there is a deed restriction, if the land is listed as having an Agricultural Preservation Restriction, or if the MassDEP has placed a restriction on the property for wetland conservation. Typically, land owned by other agencies (such as a municipal Parks and Recreation Commission or the local school system) may not be presumed to be permanently protected.

Publicly owned open space may also be subject to protection under Section 4(f) of the Department of Transportation Act of 1966[7] for any actions undertaken by the Federal Transit Administration, Federal Railroad Administration, or Federal Highway Administration. Section 4(f) of the Act states, "the Secretary of Transportation will not approve any program or project that requires the use of any publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance or land from an historic site of national, state, or local significance as determined by the officials having jurisdiction thereof, unless there is no feasible and prudent alternative to the use of such land and such program, and the project includes all possible planning to minimize harm resulting from the use."

Section 4(f) resource categories include:

- Public parks;
- Public recreation areas;

[3] MEPA Regulations 301 CMR 11.00. ACECs are specifically addressed at 301 CMR 11.03(11).
[4] EEA. 2009. *South Coast Rail Project: Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form*, April 3, 2009. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs: Boston.
[5] Article XCVII of the Articles of Amendment to the Constitution of the Commonwealth of Massachusetts. Website http://www.mass.gov/legis/const.htm.
[6] DCS. 2008. *Open Space and Recreation Plan Requirements*, Website http://www.mass.gov/Eoeea/docs/eea/dcs/osplanreq08.pdf.
[7] United States Department of Transportation Act of 1966, Section 4(f). In 1983, the Act was re-codified and Section 4(f) is now 49 USC, Section 303, "Policy on lands, wildlife and waterfowl refuges, and historic sites."

- Publicly-owned wildlife and waterfowl refuges of national, state, or local significance; and
- Historic sites of national, state, or local significance (including properties listed in or eligible for listing in the National Register of Historic Places and archaeological sites warranting preservation in place).

Playgrounds on public school properties are also considered Section 4(f) public recreation areas if they are publicly owned, open to the public after normal school hours, used for recreation, and are considered a significant recreational resource in the community by the officials having jurisdiction over the resource.

4.10.1.3 Methodology

Available mapping (2005 MassGIS data), supplemented by field visits and information provided by South Coast municipalities, were used to identify, characterize, and map open space and ACECs within 0.25 mile distance of each section of the alternative corridors that is not currently in passenger transportation use. The distance of 0.25 mile was selected as the maximum extent of resource areas that could potentially be affected by the alternatives. Each municipality through which an alternative passes received a letter in December 2008 requesting information on additional public or private open space parcels not identified by MassGIS. The request letters and municipality responses received are provided in Appendix 4.10-A.

4.10.2 Existing Conditions

This section identifies public parks, public conservation areas, public recreation areas, and wildlife refuges (protected open space) and ACECs within 0.25 mile of each proposed alternative. Although not subject to regulatory jurisdiction, important privately owned conservation lands adjacent to each corridor are also identified and described. These open space parcels are described below and depicted in Figures 4.10-3a-d through 4.10-9a-b.

4.10.2.1 Regional Overview

The South Coast Rail project would serve and could impact the following ten communities: Canton, Stoughton, Easton, Taunton, Raynham, Berkley, Lakeville, Freetown, Fall River and New Bedford. South Coast Rail alternative alignments pass through these communities, and new station sites are within or near each. Accordingly, these ten communities constitute the Public Open Space and ACECs study area. Protected public open space, selected private open space, and ACECs within each of these municipalities, relative to the alternative alignments and station sites, are discussed below.

In 2008, just over 18 percent of the South Coast communities'[8] land area was considered permanently protected public open space.[9] Of the ten communities impacted by the Build Alternatives, most of the protected public open space is in Easton and the coastal communities of Fall River and New Bedford, and the towns of Freetown, Lakeville and Taunton. An important permanently protected public area is the Freetown-Fall River State Forest, which includes 5,441 acres of public open space. The southern

[8] This refers to the 27 South Coast communities analyzed in the DEIS/DEIR, not the 10 communities that constitute the Public Open Space and ACEC Study Area in this FEIS/FEIR.

[9] EOT and Massachusetts Office of Housing and Economic Development. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Office of Housing and Economic Development. Prepared by Goody Clancy: Boston.

coastal communities generally contain more undeveloped land than the northern inland communities within the South Coast region.

Public open space within the study area includes one National Historic Park (New Bedford Whaling National Historic Park), the Freetown-Fall River State Forest, conservation areas, and recreation areas. Recreation areas, both developed parks and natural forested areas, are the most common types of public open space. Although not permanently protected, fields and play areas at public schools within the study area have also been identified.[10]

In addition to the protected public open space properties described below, several properties owned by non-profit and/or non-governmental organizations are located within 0.25 mile of the South Coast Rail corridors. Figure 4.10-1 depicts the major public and private open space and recreation resources.[11]

ACECs in the South Coast Rail study that are either crossed by or adjacent to the Build Alternatives include Canoe River Aquifer, Hockomock Swamp, Three Mile River, and Fowl Meadow and Ponkapoag Bog (Figure 4.10-2).

4.10.2.2 Existing Conditions within the Study Corridor

Southern Triangle (Common to All Build Alternatives)

All Build Alternatives would require improvements to the existing active rail infrastructure south of Weir Junction in Taunton (the New Bedford Main Line and the Fall River Secondary). This section identifies and describes the state-designated ACECs and public parks, public conservation areas, public recreation areas, and wildlife refuges within 0.25 mile of the New Bedford Main Line (Figures 4.10-3a-d) and the Fall River Secondary (Figures 4.10-4a-c). Identified privately owned open space is also described.

Areas of Critical Environmental Concern

No designated ACECs are present in the areas adjacent to the New Bedford Main Line and Fall River Secondary.

Protected Public Open Space

Table 4.10-1 lists all of the identified protected public open space within 0.25 mile from the New Bedford Main Line and the Fall River Secondary. Selected protected public open spaces adjacent to the New Bedford Main Line or the Fall River Secondary are described below.

Howland Road Area—The Howland Road Area[12] is in the southwestern portion of Lakeville (Figure 4.10-3c), adjacent to the New Bedford Main Line and the Assonet Cedar Swamp Wildlife Sanctuary (owned by the Massachusetts Audubon Society and described below). The Town of Lakeville owns the 636-acre parcel surrounding a 560-acre farmland.

[10] Public school fields and play areas are only public if they are open to the general public after hours. This report includes all fields as hours of operation and availability of these resources were not available at the time of this report.

[11] Major public and private open spaces are those that are generally greater than 20 acres and visible at the scale of the figure.

[12] Southeastern Regional Planning and Economic Development District, Town of Lakeville Priority Development and Priority Protection Area Plan, June 2008, page 12.

Table 4.10-1 Southern Triangle Protected Public Open Space

City/Town	Name	Ownership	Type
New Bedford Main Line			
Lakeville	Howland Road Area	Town	C
	Apponoquet Regional High School sports fields[13]	Town	E
New Bedford	Acushnet Cedar Swamp	State-DCR	C
	Brooklawn Park	City	R
	Abraham Lincoln School sports fields	City	E
	Hayden/McFadden Play Area	City	E
	Clasky Common Park	City	R
	New Bedford Whaling National Historic Park	Federal – NPS	H/C
	Fisherman's Wharf Pier #3	City	R
	Rasmus Tonnessen Park	City	R
	State Pier	State – DCR	R
	Coast Guard Park	City	R
	Wings Court	City	R
	Salvation Army Play Area	City	R
	Baby Kenny's Tot Lot	City	R
Fall River Secondary			
Freetown	Forge Pond	Town	B
	Freetown-Fall River State Forest	State – DCR	B
Fall River	North Park	City	R
	Bicentennial Park	City	R
	Fall River Heritage State Park and walkway	State - DCR	R
	Turner Playground	City	R
	Heritage Park	City	R
	Ponta Delgada Plaza	City	R

Sources: MassGIS 2002, 2005; municipal data 2009, aerial mapping and online research (various).
Key: NPS National Park Service; DCR Massachusetts Department of Conservation and Recreation.
R = Recreation; C = Conservation; B = Conservation and Recreation; E = Educational Facility with publicly used recreation facilities; H/C = Historic/Cultural

Acushnet Cedar Swamp State Reservation—The Acushnet Cedar Swamp State Reservation is an approximately 1,000-acre property owned by DCR in New Bedford and Dartmouth, north of the New Bedford Airport and adjacent to portions of the New Bedford Main Line (Figures 4.10-3d). It includes an outstanding example of an Atlantic white cedar swamp and provides habitat for state-listed rare wetlands wildlife and other state-listed rare, endangered, or special concern species. This is one of eight cedar swamps in public ownership in Massachusetts, and has been designated as a National Natural Landmark.[14] The New Bedford Main Line, currently used for freight rail service, forms the eastern boundary of the State Reservation.

[13] Schools have been listed in this report because they contain recreational resources; however, school fields are only considered public open space if they are available to the public after hours. It was not currently possible to confirm this information. Additionally, school properties are not considered protected because they may be sold in the future.

[14] Sorrie, B.A. and H.L. Woolsey, 1987. The Status and Distribution of Atlantic White Cedar in Massachusetts. In A. Laderman, Atlantic White Cedar Wetlands, Westview Press. pp. 135-142.

New Bedford Whaling National Historic Park—The New Bedford Whaling National Historic Park is in downtown New Bedford (Figure 4.10-3d). The park is generally the area between MacArthur Drive, Union Street, Acushnet Avenue, and Kempton Street. Established in 1996 as a National Historic Landmark District, the park's mission is to preserve, protect, and interpret certain districts, structures, and artifacts that are associated with the history of whaling and related social, economic, and environmental themes for the benefit and inspiration of this and future generations. Some of the properties within the boundary of the park are owned by the National Park Service (NPS).

Forge Pond—Forge Pond is the uppermost and largest pond along the Assonet River in Freetown (Figure 4.10-4a). The Fall River Secondary passes through the protected public open space associated with Forge Pond and adjacent to the pond itself. Forge Pond is approximately 4 acres and is managed by the Town of Freetown Board of Selectmen. The protected open space shown on Figure 4.10-4a associated with Forge Pond is accessible only from the water at Forge Pond. The pond's primary purpose is passive recreation and conservation.

Freetown-Fall River State Forest—The Freetown-Fall River State Forest is a 5,441-acre property with access from Slab Bridge Road in Freetown and located along the Fall River Secondary (Figures 4.10-4a-b). The State Forest provides recreational facilities, including a picnic area and 50 miles of unpaved roads and trails used for hiking, mountain biking, horseback riding, and snowmobiling. Hunting and fishing are also popular uses of the State Forest, particularly Rattlesnake Brook, which is stocked with brook trout. The Freetown-Fall River State Forest abuts the existing Fall River Secondary in Freetown. None of the active public recreation areas or trails is adjacent to the Fall River Secondary tracks.

Turner Playground—Turner Playground is a small parcel of approximately 2.4 acres located adjacent to the Fall River Secondary in Fall River (Figure 4.10-4c). The playground is at the intersection of Cherry and Locust Streets. According to the description from the latest Fall River Open Space and Recreation Plan,[15] the playground is in poor condition. The playground contains two lighted basketball courts and one playground.

Fall River Heritage State Park—Fall River Heritage State Park is adjacent to the Fall River Secondary in Fall River Figure 4.10-4c), and is owned and operated by the DCR. The approximately 8.5-acre park overlooks Battleship Cove and is home to the World War II battleship, U.S.S. Massachusetts. The park follows the shore of the Taunton River (Mount Hope Bay) and has a boardwalk, benches, groves of trees, an antique carousel, public sailing programs, and a 3-acre meadow used for summer concerts, craft festivals, and family picnics.[16]

Heritage Park—Owned and managed by the City of Fall River, Heritage Park is separated from Heritage State Park by Route 79. It is adjacent to the Fall River Secondary in Fall River (Figure 4.10-4c) and is approximately 2.7 acres. Heritage Park is used primarily as a neighborhood park, providing green space and walking trails to nearby residents.

Ponta Delgada Plaza—The Ponta Delgada Plaza (also called Gates of the City Plaza) is a 2.2-acre site on Water Street adjacent to the Fall River waterfront and the Fall River Secondary (Figure 4.10-4c); this is the site of the proposed Battleship Cove Station. The site is a rectangular-shaped parcel, currently

[15] Green Futures. 2004. *Open Space and Recreation Plan for the City of Fall River.* Green Futures website accessed at: http://www.greenfutures.org/projects/osp/default.html on January 16, 2009.

[16] DCR. 2009. Fall River Heritage State Park. Website. http://www.mass.gov/dcr/parks/southeast/frhp.htm accessed on January 12, 2009.

owned by the City of Fall River. It contains the Gates of the City, a large triple archway that is a replica of gates in Ponta Delgada, Sao Miguel, Azores, Fall River's sister city. The site also contains parking and a grassed area.

Private Open Space

Private open space located adjacent to the New Bedford Main Line or the Fall River Secondary is briefly described below, based on readily available information.

Assonet Cedar Swamp Wildlife Sanctuary—The Assonet Cedar Swamp Wildlife Sanctuary is a 1,000-acre parcel of conservation land owned by the Massachusetts Audubon Society in southwest Lakeville, near the Berkley and Freetown town lines (Figure 4.10-3b). The New Bedford Main Line passes through the wildlife sanctuary and the Fall River Secondary passes nearby. This property consists largely of the wetlands bordering the Cedar Swamp River south of Myricks Junction. These wetlands include extensive Atlantic white cedar swamps and support numerous state-listed species.

Stoughton and Whittenton Alternatives

This section identifies and describes the state-designated ACECs and public parks, public conservation areas, public recreation areas, and wildlife refuges within 0.25 mile of the Stoughton Electric and Diesel Alternatives (Figures 4.10-5a-e), as well as within 0.25 mile of the Whittenton Electric and Diesel Alternatives (Figures 4.10-6a-b). Identified privately owned open space is also described. In general, protected open space and ACECs adjacent to the Northeast Corridor alignment segment have been excluded from the existing conditions discussion as the Build Alternatives do not include any construction activity along the Northeast Corridor.

Areas of Critical Environmental Concern

The Stoughton and Whittenton Alternatives pass through or near four ACECs: Fowl Meadow and Ponkapoag Bog, Hockomock Swamp, The Canoe River Aquifer, and the Three Mile River Watershed (Figure 4.10-2, Figure 4.10-5a-e and Figures 4.10-6a-b). These resources are described below.

Fowl Meadow and Ponkapoag Bog—The Fowl Meadow and Ponkapoag Bog ACEC, designated in 1992, encompasses approximately 8,350 acres[17] and is located in the metropolitan Boston region, including Boston, Canton, Dedham, Milton, Norwood, Randolph, Sharon, and Westwood. The Northeast Corridor passes through the Fowl Meadow portion of this ACEC from near the Readville Station to near the Canton Junction Station (Figure 4.10-5a). The ACEC is fragmented by several major transportation corridors, including I-95, I-93, Route 24, Route 138, Route 1, and other roadways. It also includes upland areas that are developed commercial and residential lands as well as undeveloped forested upland and farmland.

The central resource features of the Fowl Meadow and Ponkapoag Bog ACEC are the Neponset River and the Ponkapoag Pond and Bog. An 8-mile stretch of the Neponset River and its tributaries, the adjacent wetlands and floodplains, the associated aquifers and public water supplies, and the diverse habitats form the core resources of the Fowl Meadow portion of the ACEC. Ponkapoag Bog and Pond and the natural communities and wildlife habitats form the core resources of the Ponkapoag Bog

[17] DCR. 2013. Fowl Meadow and Ponkapoag Bog. Website: http://www.mass.gov/eea/agencies/dcr/conservation/acec/fowl-meadow-and-ponkapoag-bog.html.

portion of the ACEC. Historical and archaeological resources and the recreational and educational values of both areas support their overall significance to the people and communities of the area.

The Fowl Meadow area includes the largest wetland and floodplain areas in the Neponset River basin. There are several municipal public wells that provide water to the communities of Canton, Dedham, and Westwood. The northern Fowl Meadow area and Ponkapoag Bog have been designated a National Environmental Study Area by the NPS. Approximately 2,330 acres of the ACEC are owned by DCR, and are managed as part of the Blue Hills Reservation.

The Northeast Corridor forms the eastern boundary of the ACEC between Neponset Street in Canton and I-95, and forms the western boundary of the ACEC southwest of the I-95/I-93 interchange. The Northeast Corridor passes through the ACEC north of I-95, where the existing rail line parallels the Neponset River.

Hockomock Swamp ACEC—The Hockomock Swamp ACEC, designated in 1990 includes approximately 16,950 acres[18] in Bridgewater, Easton, Norton, Raynham, Taunton, and West Bridgewater. The ACEC is fragmented by several major transportation corridors, including Routes 24, I-495, 138, 106, other major roadways, and the existing, abandoned MBTA-owned railroad grade/right-of-way and it includes substantial upland areas within the watershed of the Hockomock Swamp. These uplands include developed commercial and residential lands as well as undeveloped forested upland and farmland. The Stoughton and Whittenton alignments pass through the Hockomock Swamp ACEC from near Purchase Street in Easton to Bridge Street in Raynham (Figures 4.10-5c-d), along the aforementioned abandoned MBTA-owned railroad grade/right-of-way.

The Hockomock Swamp and associated wetlands and water bodies are described by DCR as the largest vegetated freshwater wetland system in Massachusetts, with outstanding natural resource qualities. The wetlands, which include Hockomock Swamp, Dead Swamp, Titicut Swamp, and Little Cedar Swamp, serve as the headwaters of the Town River, a tributary of the Taunton River, and overlay a system of high and medium yield aquifers that supply public drinking water through wells in Raynham and West Bridgewater.

The Hockomock Swamp ACEC provides habitat for several species listed as rare, endangered, or of special concern by the NHESP and much of the ACEC is designated as BioMap Core Habitat. The DCR describes the Hockomock Swamp ACEC as one of the most extensive inland wildlife habitats in southeastern Massachusetts. The Atlantic white cedar swamp and acidic fen wetland communities scattered throughout the ACEC are considered to be outstanding examples of these unique natural communities. The ACEC is important for its significant scenic sites.

The Massachusetts Division of Fisheries and Wildlife (DFW) owns approximately 5,000 acres within the Hockomock Swamp. The Hockomock Swamp Wildlife Management Area (WMA) provides public access to the swamp and to several recreational areas. Additional public and nonprofit lands are located within the ACEC. The area is popular for hunting, fishing, boating, canoeing, swimming, and for observing and studying flora and fauna.

The MBTA has continued to own the railroad right-of-way through the WMA and the ACEC from Route 123 in Easton to I-495 in Raynham. This land was acquired by the MBTA from the New York, Hartford

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[18] DCR. 2009. Hockomock Swamp. Website http://www.mass.gov/dcr/stweardship/acec/acecs/l-hcksmp.htm. Accessed on September 1, 2009.

and New Haven Railroad in 1973 and reserved as a public transportation corridor. Although the right-of-is used as an informal recreation trail, including the use of all-terrain vehicles both on and off the right-of-way, this is not an authorized use, as this is a designated transportation land and cannot be converted to recreational use. The right-of-way is not subject to Article 97 because it is not a public "land or easement taken or acquired for the conservation of forest, water, air, and other natural resources."

Canoe River Aquifer ACEC—The Canoe River Aquifer ACEC, designated in 1991, covers approximately 17,200 acres[19] in Easton, Foxborough, Mansfield, Norton, Sharon, and Taunton. The associated areas within this ACEC include Snake River, Watson Pond, and Lake Sabbatia. As the Whittenton Branch crosses the Raynham-Taunton town boundary, it passes near this ACEC (Figure 4.10-6a).The ACEC is fragmented by several major transportation corridors, including I-495, Route 123, Route 106, and other major roadways. It includes substantial upland areas that are developed commercial and residential lands as well as undeveloped forested upland and farmland.

The Canoe River Aquifer ACEC is located adjacent to the Hockomock Swamp ACEC and within the Taunton River basin. It is generally defined by the Canoe River watershed and the underlying aquifer. It has an extensive system of surface waters, wetlands, floodplains, and high-yield aquifers. The aquifers provide high quality drinking water from wells to four of the towns located within the ACEC, Easton, Sharon, Mansfield and Norton.

The ACEC provides a rich and diverse habitat for wildlife including rare and endangered species habitat and Atlantic white cedar swamps. The upland portions of the area are a mix of open fields, deep woods, transitional woodlands, and more than 1,000 acres of productive farmland and cranberry bogs. The ACEC also includes municipal and nonprofit conservation and recreational lands, and rich archaeological and historic resources, as further detailed in Chapter 4.8, *Cultural Resources*.

Three Mile River Watershed ACEC—The Three Mile River Watershed ACEC, designated in 2008, covers approximately 14,276[20] acres in Dighton, Norton, and Taunton. The ACEC is fragmented by Route 140, a major transportation corridor, and several other major roadways. It includes substantial upland areas that are developed commercial and residential lands as well as undeveloped forested upland and farmland. The Attleboro Secondary and Whittenton Branch are in close proximity to the Three Mile River Watershed ACEC in the vicinity of Whittenton Junction (Figure 4.10-6a).

The Three Mile River Watershed is located south and adjacent to two other designated ACECs, the Canoe River Aquifer and Hockomock Swamp. The ACEC includes a wetland and stream complex tributary to the Taunton River and is located within the Taunton River Watershed. The resources of the area include fishery habitat, inland wetlands, inland surface waters, water supply areas, natural hazard areas including floodplains, agricultural areas including farmland and forestry land, archaeological and historical resources, habitat resources including state-listed rare species habitat, and special use areas including undeveloped natural areas, public recreational areas, and scenic areas.

The Three Mile River Watershed ACEC provides habitat for at least seven species listed as rare, endangered, or of special concern by the Natural Heritage and Endangered Species Program (NHESP) and contains many important habitats. Approximately 5,881 acres within the ACEC are identified as Core

[19] DCR. 2013. Canoe River Aquifer, Snake River, Watson Pond, and Lake Sabbatia. Website: http://www.mass.gov/eea/agencies/dcr/conservation/acec/canoe-river-aquifer-snake-river-watson-pond.html.
[20] DCR. 2013. Three Mile River Watershed. Website: http://www.mass.gov/eea/agencies/dcr/conservation/acec/three-mile-river-watershed.html.

Habitat Area according to the NHESP's BioMap data. The floodplain provides essential breeding habitat for many reptile and amphibian species, including several NHESP listed species, as further detailed in Chapter 4.15, *Threatened and Endangered Species*.

The surface waters of the Three Mile River are the core of the ACEC and were a former herring run. Currently, the river provides one of the best warm water fisheries in the area. The quality of the water in the river, due in part to the largely undeveloped river corridor and surrounding lands, enables the Three Mile River Watershed to provide a large area of outstanding habitat.

Protected Public Open Space

Table 4.10-2 lists the protected public open space within 0.25 mile of the Stoughton Line and the Whittenton Branch, shown in Figures 4.10-5a-e and 4.10-6a-b. Selected protected public open spaces adjacent to the Stoughton Line are briefly described, based on readily available information, in the following paragraphs.

D. Forbes Estate—Located in Stoughton, adjacent to the Stoughton Line (Figure 4.10-5a), the D. Forbes Estate is conservation land owned and managed by the Town of Stoughton Conservation Commission. The conservation land totals approximately 22 acres and has limited access. The only frontage is approximately 200 feet on Island Street.

Stoughton Memorial Conservation Land—The Town of Stoughton's Memorial Conservation Land (which includes the Bird Street Conservation Lands) is a 675-acre parcel west of the Stoughton Line (Figure 4.10-5b), extending from Plain Street to the Easton town line and west of the Bird Street Conservation Area (which is not within 0.25 mile of the corridor). The Stoughton Conservation Memorial Lands represent the largest contiguous conservation area owned by the Town of Stoughton.[21] The area includes the original 55-acre parcel owned by the Bird family from the mid-1700s through the 1870s before becoming a dairy farm owned by the Connor family.

The majority of the land is wooded, but it also contains large areas of open fields. The area supports a variety of habitats, including a former quarry, old fields, a pond, marshes, forested wetlands, and forested uplands. The 14-acre pond is used for swimming and fishing. The principal access to the property is off Bird Street. The gated entrance allows pedestrians to access a system of trails used for hiking, horseback riding, and cross-country skiing that extend throughout the area and provide additional pedestrian access from West Street and Plain Street. The Conservation Commission has developed an inventory of plant and animal species observed on the property and has published a guide to the nature trails established on the land.

The area extends to the right-of-way in two locations, with a total of approximately 1,500 feet of frontage. One location is a narrow strip where the railroad closely parallels Route 138 south of Morton Street. The second location is south of Totman Farm Road, extending to the Easton town line on the west side of the right-of-way. The majority of the area and all of the developed trail system are more than 1,000 feet from the MBTA right-of-way.

[21] Town of Stoughton. 2006. Town of Stoughton Open Space and Recreation Plan. Prepared by Horsley Witten Group, public review draft. April 2006, page 38.

Table 4.10-2 Stoughton Alternatives Protected Public Open Space

City/Town	Name	Ownership	Type
Stoughton Line			
Canton	Neponset River Reservation	State - DCR	B
	Canton High fields	Town	E
	Curtis Road Conservation Area (3 parcels)	Town	C
	Bolivar Pond and Swimming Area	Town	R
	Cabot Devoll Field	Unknown	R
Stoughton	D. Forbes Estate	Town	C
	Stoughton School Fields	Town	E
	Elm Street Field	Town	R
	Lipsky Field	Town	R
	Lehan Field	Town	R
	Marks Field	Town	R
	Halibran Field (Jones School)	Town	E
	Meads Meadow	Town	R
	Cedar Swamp (Stonehill College Gift Area and Sumner Gardens)	Town	C
	Stoughton Memorial Conservation Land	Town	B
	Libby Farm	Town	B
Easton	Conservation Land, off Wedgewood Drive	Town.	C
	Conservation Land, off Cobblestone Road	Town	C
	Veterans Memorial Park	Town	R
	Ricker Field	Town	R
	Conservation Land, off Purchase Street	Town	C
	Old Baldwin Street Dump	Town	C
	Frothingham Park	Town	R
	Hockomock Swamp WMA	State - DFW	C
	Conservation Land, off Prospect Street	Town	C
	Southeastern Regional Vocational Technical School sports fields	Southeastern Regional School District	E
	Town Land (near Black Brook)	Town	C
Raynham	Pine Swamp Conservation Area	Town	B
Taunton	Hartshorn Park	City	R
	Plonka Property	City	C
	Weir Park	City	R
	Summer Street School sports fields	City	E
Whittenton Branch			
Taunton	Unnamed parcel, off Third Avenue	City	R
	Mill River Park	City	R
	Memorial Park	City	R

Sources: MassGIS 2002, 2005; municipal data 2009, aerial mapping and online research (various).
Key: DCR Massachusetts Division of Conservation and Recreation; DFW Massachusetts Division of Forestry and Wildlife
R = Recreation; C = Conservation; B = Conservation and Recreation; E = Educational Facility; H/C = Historic/Cultural

Hockomock Swamp Wildlife Management Area—A description of this area is included above in the discussion of the Hockomock Swamp ACEC.

Pine Swamp Conservation Area—Pine Swamp is a 275-acre wetland system located in western Raynham and consisting of several properties that are owned by the Town of Raynham Conservation Commission. The Stoughton Alternatives crosses the swamp in a 1-mile segment from King Phillip Street to East Britannia Street (Figure 4.10-5-d); however, the Whittenton Alternatives would avoid crossing this area as the Whittenton Branch diverges to the southwest at Raynham Junction, north of the Pine Swamp. The Pine Swamp Conservation Area consists of forested and marsh wetlands associated with Pine Swamp, an area that is located within estimated habitat of several rare wetlands species, and supports an Atlantic white cedar swamp community. The former railroad bed through the Conservation Area is owned by the Taunton Municipal Light Corporation, and maintained as a utility corridor with an overhead power line. As indicated by the Town of Raynham municipal assessor office's maps, the utility corridor right-of-way is not owned by the Town of Raynham as Conservation Land.

The Taunton Municipal Light Corporation periodically maintains the right-of-way by clearing vegetation on the right-of-way and in the adjacent wetland. Although there are no trails or designated points of public entry, the former rail right-of-way is used by pedestrians, all-terrain vehicles, off-road motorbikes, and other vehicles.

Hartshorn Park—Hartshorn Park is off Longmeadow Road and adjacent to the Stoughton Line in Taunton. The park is immediately east of the proposed Taunton (Dean Street) Station site (Figure 4.10-5e). Owned by the City of Taunton and operated by the Parks and Recreation Department, Hartshorn Park contains two baseball diamonds used for adult softball and a children's play area.

Private Open Space

Private open space within 0.25 mile of the Stoughton Line or the Whittenton Branch consists of the Sheep Pasture area described below.

Sheep Pasture—Sheep Pasture is east of the Stoughton Line and southeast of Easton Village in Easton (Figure 4.10-5b). The pasture is adjacent to the Old Baldwin Street Dump. The approximately 154-acre Sheep Pasture is owned and managed by the Natural Resources Trust of Easton and serves as the Natural Resources Trust of Easton's headquarters. Sheep Pasture is a wildlife sanctuary and the Natural Resources Trust of Easton operates many educational programs from this site, including day camps for children.

4.10.3 Analysis of Impacts and Mitigation

This section identifies the effects to protected open space or designated ACECs that may result from implementing each of the proposed South Coast Rail project alternatives (including railroad or highway alignments, train or bus stations, and layover facilities).

4.10.3.1 Impact Assessment Methodology

As required by the CEQ under NEPA, the analysis of the environmental consequences includes discussion of the direct and indirect effects of a proposed action, and their significance. Direct effects are defined as those "which are caused by the action and occur at the same time and place." Indirect

effects are defined as those "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."

Similarly, MEPA requires "a detailed description and assessment of the negative and positive potential environmental impacts of the Project and its alternatives. The EIR [Environmental Impact Report] shall assess (in quantitative terms, to the maximum extent practicable) the direct and indirect potential environmental impacts from the Project that are within the Scope. The assessment shall include both short-term and long-term impacts for all phases of the Project (e.g., acquisition, development, and operation) and cumulative impacts of the Project, any other Projects, and other work or activity in the immediate surroundings and region."

- The impact assessment focuses on acquisition of property within protected open spaces or ACECs, responding to these aspects of the Certificate requirements listed above. Other requirements, such as evaluation of wetlands, water resources, biodiversity, and rare species within protected open spaces or ACECs, are addressed in detail in other sections specific to those issues and summarized in this section.

The methods for evaluating of potential direct and indirect effects of the South Coast Rail alternatives to protected open spaces and ACECs are described below.

Method for Assessing Direct Impacts

Potential direct impacts to protected open spaces and ACECs were evaluated by reviewing areas where new construction would be required for each of the alternative alignments with respect to mapped sites to identify where the corridors passed through, were adjacent to, or were proximate to (within 0.5 mile of) these sites. For the purposes of this evaluation, "new construction" is defined as upgrading existing rail lines, reconstructing rail lines along historic railroad alignments, replacing existing railroad bridges and culverts, constructing new permanent or temporary railroad bridges, reconfiguring at-grade road/railroad crossings, and constructing new grade-separated road/railroad crossings.

The analysis was conducted to determine if:

- Land acquisition would be required; or
- The temporary or permanent use of protected open space or ACECs would adversely affect traffic patterns near or access to or within those protected open spaces or ACECs.

For the purposes of this evaluation, "land acquisition" is defined as taking a greater than 500-square-foot portion, or a sliver great than 10 feet wide, of any parcel outside of the existing rights-of-way to accommodate permanent construction impacts, and are based upon conceptual engineering plans. Parcel acquisition below this threshold was excluded because using small portions of the protected open space or ACEC is unlikely to change the conservation or recreation function of the parcel. Final engineering for the selected alternative would allow more specific identification of land acquisition requirements of small portions of parcels. Minor open spaces, such as landscaping elements along public roadways, were also not considered in the evaluation of land acquisition. Temporary construction impacts outside of the existing rights-of-way would not require land acquisition and are therefore not considered in this evaluation. However, obtaining a temporary construction easement in an Article 97

land could require approval by the legislature. Land acquisition within ACECs was only reviewed with respect to publicly owned parcels.

Aerial photographs were examined in reference to preliminary engineering plans to identify encroachments into protected open spaces or ACECs, and to identify potential substantive changes access to the sites based upon any necessary road closures or realignments. Final engineering plans may show an increase or decrease of the actual area of acquisition required.

The most current version of the South Coast Rail design was reviewed to identify where open space impacts may occur. Potentially impacted locations were evaluated to determine acquisition requirements and ascertain the nature and extent of certain open space resources, such as visual and recreational values (e.g., Wild and Scenic River designation), at each location.

Specific resource aspects of protected open spaces or ACECs are addressed in other chapters, as follows:

- Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*, includes an assessment of the alternatives' impact to biodiversity in protected open spaces or ACECs.
- Chapter 4.11, *Farmland Soils*, includes a review of agricultural development to identify locations where activities associated with each alternative could adversely impact prime farmland, unique farmland, or farmland of statewide or local importance, within protected open spaces or ACECs.
- Chapter 4.8, *Cultural Resources*, includes a review of cultural resources data to identify locations where alternatives could adversely impact historic or archaeological resources in protected open spaces or ACECs.
- Chapter 4.15, *Threatened and Endangered Species*, includes a review of biological data to identify locations where alternatives could adversely impact rare species in protected open spaces or ACECs.
- Chapter 4.17, *Water Resources*, includes a review of hydrologic data to identify locations where alternatives could adversely impact water quality or hydrology in protected open spaces or ACECs.
- Chapter 4.16, *Wetlands*, identifies wetlands where alternatives could adversely impact the functions and values of these resources in protected open spaces or ACECs.

Method for Assessing Indirect Impacts

Potential indirect effects to protected open spaces and ACECs are addressed in Chapter 5, *Summary of Indirect Effects and Cumulative Impacts.* The analysis of indirect effects was conducted to identify any growth-inducing effects and other effects related to induced changes that may result in a change in use of protected open spaces or ACECs.

4.10.3.2 Impacts of Alternatives by Element

No-Build (Enhanced Bus) Alternative

The No-Build Alternative (Enhanced Bus) would improve transit service to Boston from New Bedford, Fall River, and Taunton by adding more buses but using smaller capital investments than are proposed in the Build Alternatives. Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts.

The No-Build Alternative plan includes bus schedule enhancements, transportation demand management, and transportation policy enhancements for commuter bus. In addition to these enhancements, and incentives would enable the private commuter bus service operators to acquire a new fleet of fuel efficient and clean emission buses. Ideally, these buses would provide rider comfort and amenities comparable to commuter rail service.

Existing commuter bus service to Boston from New Bedford, Fall River, and Taunton is currently provided by three commuter bus carriers: DATTCO provides Boston – New Bedford service; Peter Pan provides Boston – Fall River bus service; and Bloom provides Boston – Taunton service.

Some of these alignments and associated Park and Ride facilities pass through or are in proximity to protected open spaces and/or ACECs. However, given that these alignments would not change and no new construction or land acquisition would be required for the No-Build Alternative, this alternative would not directly affect protected open spaces and/or ACECs. Should three of the Park-and-Ride facilities that are at capacity need to be expanded or relocated, such could be achieved without requiring construction within protected open spaces and/or ACECs.

Southern Triangle (Common to All Build Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all Build Alternatives. These rail lines form a rough triangular shape running south from Myricks Junction to Fall River (the Fall River Secondary) and from Weir Junction through Myricks Junction to New Bedford (the New Bedford Main Line), and are therefore referred to as the Southern Triangle (Figure 1.4-1). The following sections describe the environmental consequences to protected open spaces and ACECs that may result from new construction for these two components of the Build Alternatives. The northern part of the South Coast Rail study area is described in subsequent sections.

Fall River Secondary Rail Segment

The 12.3 miles of existing freight track along the existing Fall River Secondary freighttrack would be upgraded and maintained to Federal Rail Administration (FRA) Class 7 options[22] for the South Coast Rail project. The line would be double-track from Weir Junction to Myricks Junction, with a 0.9-mile third track for freight movements near Taunton Depot Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 mile. The remainder of the line would be single-track, with the exception of a 1.8-mile double-track section in Freetown and a 1.7-mile section in New Bedford. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the Fall River Secondary is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be

[22] FRA. 2009. 49 CFR 213.9 Classes of Track: Operating Speed Limits. US Department of Transportation, Federal Rail Administration.

constructed along the length of the line, and traction power facilities at selected locations, for the electric alternatives.

Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one new station would be constructed in Freetown (Freetown). One new layover facility would be constructed in Fall River, at the Weaver's Cove East site. Potential impacts to protected open spaces and ACECs resulting from constructing and using the new stations and layover facility along the Fall River Secondary are considered in Sections 4.10.3.3 and 4.10.3.4, respectively.

Several protected open spaces are adjacent to the Fall River Secondary. No ACECs are present along this corridor and, accordingly, no direct effects to ACECs would result from the Fall River Secondary construction activities. Although protected open spaces are near the Fall River Secondary, no protected open space land would be acquired for improving the line for either the electric or the diesel alternatives. Figure 4.10-4a-c shows the Fall River Secondary alignment construction disturbance limits and the nearby protected open spaces.

Access to protected open spaces along the Fall River Secondary would not be affected by the Build Alternatives.

New Bedford Main Line Rail Segment

The 19.4-mile existing freight tack along the New Bedford Main Line would be upgraded to FRA Class 7 options for the South Coast Rail project. The line would be double-track from Weir Junction to Myricks Junction, with a 0.9-mile third track for freight movements near Taunton Depot Station. A short segment of the line would be double-track south of Myricks Junction, 0.8 mile. The remainder of the line would be single-track, with the exception of 1.8-mile double-track section in Freetown and a 1.7-mile section in New Bedford. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the New Bedford Main Line is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and traction power facilities at selected locations, for the electric alternatives. Two new train stations would be constructed in New Bedford (King's Highway and Whale's Tooth) and one new train station would be constructed in Taunton (Taunton Depot). One new layover facility would be constructed in New Bedford at either the Wamsutta site. Potential impacts to protected open spaces and ACECs resulting from constructing and using the new stations and layover facility along the New Bedford Main Line are considered in Sections 4.10.3.3 and 4.10.3.4, respectively.

The New Bedford Main Line passes through or is adjacent to several protected open spaces (Figures 4.10-3a-d). No ACECs are present along this corridor and, accordingly, no direct effects to ACECs would result from the New Bedford Main Line construction activities.

No protected open space would be acquired for improving the New Bedford Main Line, and public access to nearby protected open spaces would not be impacted.

Stoughton Electric Alternative

The Stoughton Electric Alternative north of the Southern Triangle would comprise two segments: a portion of the Northeast Corridor and all of the Stoughton Line. This alternative would use the Northeast Corridor from South Station to Canton Junction. From Canton Junction, the existing Stoughton Line

would be used to the existing Stoughton Station. Commuter rail service would be extended, reconstructing a railroad on an out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton. This alignment joins the New Bedford Main Line at Weir Junction, the northern end of the Southern Triangle.

This evaluation focuses on the existing and extended Stoughton Line segment. No construction would be required in the Northeast Corridor segment for this alternative, and the Southern Triangle portions were addressed above.

The existing single track commuter rail line would be upgraded and maintained to FRA Class 7. A new second track would be constructed from Canton Junction to the existing Stoughton Station, a distance of 3.8 miles, where existing passenger service ends. A new double track would extend south of Stoughton Station to the proposed North Easton Station. The remainder of the line south to Weir Junction would be single- track, with a 2.2-mile long double-track section in Raynham, and a 0.6 mile long double-track section in Taunton. Approaching Weir Junction, an additional 0.4 mile siding track would be provided for freight use only. All of the existing at-grade road/railroad crossings would be reconfigured and/or improved to meet current safety standards. New catenary supports and wires would be constructed along the length of the line, and electric substations at selected locations.

One existing train station along the Stoughton Line would be reconstructed (Canton Center). Four new train stations would be constructed along this alignment (Stoughton, North Easton, Easton Village, Raynham Park, and Taunton). No new layover facilities would be constructed along this segment. Potential impacts to protected open spaces and ACECs from reconstructing the existing and developing the new stations along the Stoughton Line are considered in Section 4.10.3.3.

One ACEC is present along this corridor, the Hockomock Swamp ACEC. The Stoughton Line passes through the Hockomock Swamp ACEC beginning at Depot Street in Easton and extending south to near I-495 in Raynham. A 1.6-mile long trestle would be constructed where the Stoughton Line passes through the Hockomock Swamp within the ACEC. The Stoughton Line also passes through or is adjacent to numerous protected open spaces, including Pine Swamp south of Taunton.

The estimated area of protected open space and publicly owned parcels in the ACEC required for constructing the Stoughton Electric Alternative north of the Southern Triangle is listed in Table 4.10-3 and shown in Figures 4.10-5a-e. As a result of the ongoing refinement of the design since publication of the DEIS/DEIR, and in particular the track alignment, acquisition requirements of Article 97-protected properties have been reduced by avoiding or minimizing encroachments into these properties. For example the DEIS/DEIR estimated that the Stoughton Electric Alternative would impact 0.29 acre of Easton Conservation Land, an Article 97-protected property. However, the current design of the Stoughton Electric Alternative no longer requires that land acquisition. Based on the current level of design, this alternative would require the acquisition of a small portion of one parcel of Article 97-protected property.

The required acquisition in Stoughton, a 0.16-acre portion of the 19.38-acre Stoughton Memorial Conservation Land, would be used to re-route Morton Street (Figure 4.10-7). This acquisition of Article 97-protected land would be necessary in order to accommodate the western edge of the new road and an embankment sloping down from the road bed to the adjacent natural ground surface. The Easton acquisition would be used for a traction power facility (TPSS-1).

Table 4.10-3 Stoughton Electric Alternative Protected Open Space Acquisition

City/Town	Name	Ownership	Use	Acquisition Area (acres)
Stoughton	Stoughton Memorial Conservation Land	Public	Conservation/Recreation	0.16
Easton	Southeast Regional Vocational Tech School	Public	Recreation	0.50
Total				0.66

Sources: MassGIS 2002, 2005; municipal data 2009, aerial mapping and online research (various).

No land would be acquired from the Hockomock Swamp WMA or the Pine Swamp protected open space. The existing railroad grade is already owned by MBTA and is therefore not Article 97 land.

The existing right-of-way through the Hockomock Swamp is typically 66 feet wide, and all work for the trestle would be accomplished within the right-of-way. No land acquisition from the Massachusetts Division of Fisheries and Wildlife would be required within the Hockomock Swamp WMA. Access for constructing the trestle would be from the north at Foundry Street and from the south at Racetrack Crossing. There would be no requirement for a separate access road, either within or outside the right-of-way. Access for operations and maintenance would be from the trestle structure. A track turnout is proposed on the superstructure for maintenance vehicles. Areas below the superstructure would be accessed from each of the piers with a ladder. There would be no need for vehicular access at ground level.

Impacts to the Hockomock Swamp open space would include the loss of public access to the swamp along the railroad alignment, and a 0.5 acre property acquisition for the construction of a traction power facility (TPSS-1) within the Hockomock Swamp ACEC, located at the Southeast Regional Vocational Tech School in Easton.

No street closures in the immediate vicinity of protected open spaces or the ACEC are planned for the Stoughton Electric Alternative. During operations, temporary delays in traffic flow may occur at any road/railroad at-grade crossings; none of these delays are considered likely to substantively impact access to protected open spaces or the ACEC. Access to the Hockomock Swamp ACEC and WMA would be impacted along the Stoughton Line railroad bed: informal recreational usage of the railroad bed by pedestrians, bicyclists, all-terrain vehicles, and other similar users would be terminated. Those users would be forced to seek other sites or abandon these activities. It is not known if relocated recreational activities would be likely to occur elsewhere within the Hockomock Swamp or at other sites that are not either protected open spaces or ACECs.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative is identical to the Stoughton Electric Alternative with the exception of the locomotive power source. Diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure. There would be no overhead catenary system or traction power facilities for the Stoughton Diesel Alternative. All other aspects of the Stoughton Diesel Alternative are common with the Stoughton Electric Alternative, as described above.

The estimated area of protected open space required for constructing the Stoughton Diesel Alternative in Stoughton Line segment is listed in Table 4.10-4 and shown in Figure 4.10-7. This land acquisition is necessary for the rerouting of Morton Street. This parcel is owned by the Town of Stoughton, and would therefore be considered Article 97 land subject to the provisions of the EEA's Article 97 Land Disposition Policy.

Table 4.10-4 Stoughton Diesel Alternative Protected Open Space Acquisition

City/Town	Name	Ownership	Use	Acquisition Area (acres)
Stoughton	Stoughton Memorial Conservation Land	Public	Conservation/Recreation	0.16

Sources: MassGIS 2002, 2005; municipal data 2009, aerial mapping and online research (various).

Whittenton Electric Alternative

The Whittenton Electric Alternative is identical to the Stoughton Electric Alternative alignment described above except for the segment of the Stoughton Line between Raynham and Weir Junctions. Specifically, at Raynham Junction the Whittenton Alternative would divert to the southwest to connect to the abandoned Whittenton Branch. The Whittenton Branch would extend south and west to the Attleboro Secondary at Whittenton Junction. Along the Attleboro Secondary, the Whittenton Electric Alternative would extend to Weir Junction in Taunton. Track infrastructure improvements would include 3.6 miles of new single-track on the Whittenton Branch and 2.2 miles of single-track reconstruction on the Attleboro Secondary with a 0.3-mile siding reserved for the proposed Dana Street Station. The southernmost portion of the Stoughton Line, from Raynham Junction to Weir Junction (a distance of 5.1 miles), would not be used if this alternative is selected.

This evaluation focuses on the Whittenton Branch and Attleboro Secondary components; other portions of this alternative are described in in the preceding Southern Triangle and Stoughton Electric Alternative sections.

New track would be placed on the out-of-service Whittenton Branch railroad bed from Raynham Junction to Whittenton Junction, and 2.5 miles of the Attleboro Secondary track infrastructure would be reconstructed. Existing public at-grade road/railroad crossing would be reconfigured and/or improved to current safety standards. New catenary supports and wires would be constructed along the length of the line. One new station (Dana Street) would be constructed along the Attleboro Secondary.

The Whittenton Branch and Attleboro Secondary do not pass through nor are they adjacent to any ACEC. Although these portions of the Whittenton Electric Alternative are near the Canoe River Aquifer ACEC, the Three Mile River ACEC and the southern limit of the Hockomock Swamp ACEC, no ACECs or protected open space would be acquired. Additionally, the Whittenton Electric Alternative would not use the southernmost portion of the Stoughton Line, and would therefore not pass through the Pine Swamp protected open space, south of Raynham.

Refinements to the track design of the Whittenton Electric Alternative have eliminated the protected open space acquisition described in Section 4.10.3.2 of the DEIS/DEIR. No protected open space, including land protected by Article 97, would be acquired for the Whittenton Branch or Attleboro Secondary. Thus the Whittenton Electric Alternative would have the same impacts on protected open space and ACECs as the Stoughton Electric Alternative (see Table 4.10-3 above).

No public street closures in the vicinity of the protected open space or the Hockomock Swamp ACEC are planned. During operations, temporary delays in traffic flow may occur at the road/railroad at-grade crossings; none of these delays are considered likely to permanently impact access to the protected open space or the ACEC.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. As described above for the Stoughton Diesel Alternative, diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure. The footprint of the affected area would be smaller since power traction facilities would not be necessary. The Whittenton Diesel Alternative would not require the acquisition of any protected open space, including land protected by Article 97, along the Whittenton Branch or Attleboro Secondary portions of the alignment. As such, the Whittenton Diesel Alternative would have the same impacts on protected open space and ACECs as the Stoughton Diesel Alternative (see Table 4.10-4above).

4.10.3.3 Stations

This section provides basic descriptions of each train station, an indication of its location in or near any protected open space or ACEC, and a qualitative evaluation of the direct and indirect impacts to these sites potentially resulting from constructing (or reconstructing) and using each station for the South Coast Rail project. Because stations have different types of impacts and settings and are in several cases shared among multiple alternatives they were addressed separate from the alignments, in order to avoid redundant discussion.

Battleship Cove Station

The Battleship Cove Station (Figure 4.10-8) would be a new station constructed along the Fall River Secondary that would serve all Build Alternatives. It would be located on Water Street in Fall River, near the southern terminus of the Fall River Secondary. The Battleship Cove Station would not include any parking facilities; it is intended as a drop-off/pick-up station.

The Battleship Cove Station site is immediately adjacent to land previously developed by the city for the Ponta Delgada Plaza, a protected open space. The site is also near three other protected open spaces: Fall River Heritage State Park, Heritage Park, and Turner Playground. This site is not within or near any ACECs. No protected open space acquisition would be required for constructing the Battleship Cove Station. An agreement with the City of Fall River would be negotiated to use the Ponta Delgada Plaza as a drop-off/pick-up point for passengers using the train station.

Increased automobile traffic at the Ponta Delgada Plaza may result from using the new Battleship Cove Station there, as the commuters may use cars to transport themselves to and from the drop-off/pick-up station. Water Street also provides access to the Fall River Heritage State Park; access to this protected open space may also be impacted by increased traffic congestion at the Battleship Cove Station. However, the level of service on the adjacent streets would not change, and peak traffic usage (morning and evening commute times) would not coincide with likely park recreational use (mid-day).

Canton Center Station

The Canton Center Station (Figure 4.10-9) is an existing train station along the Stoughton Line that would be reconstructed and would serve all Build Alternatives. Located at 710 Washington Street in Canton, this station is an active transit facility that is near the Curtis Road Conservation Area and Bolivar Swimming Area protected open spaces. This site is not within or near any ACECs.

The Canton Center Station is located on Washington Street, which also provides local access to the nearby Curtis Road Conservation Area. The Bolivar Swimming Area is accessible from Bolivar Street,

which intersects Washington Street. Given the current active use of the Canton Center Station as a transit facility and the distance to these protected open spaces, substantive changes in access to the Curtis Road Conservation Area or the Bolivar Swimming Area are unlikely to occur as a result of further developing the Canton Center Station.

Dana Street Station

The Dana Street Station (Figure 4.10-10) would be a new station constructed along the Attleboro Secondary that would serve the Whittenton Alternative only. The proposed Dana Street Station site is located just south of the Danforth Street grade crossing, on the east side of the railroad between the alignment and Dana Street.

The Dana Street Station site is a currently vacant lot that is not near any protected open spaces or ACECs. No protected open space land would be acquired for constructing the Dana Street Station.

Easton Village Station

The Easton Village Station (Figure 4.10-11) would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. The Easton Village Station site is on Sullivan Avenue at the transition point to Mechanic Street (near the intersection with Pond Street) in Easton.

The Easton Village Station site is a partially developed parcel that is adjacent to the Veterans Memorial Park, Frothingham Park, and Ricker Field protected open spaces. It is not within or near any ACECs. No protected open space land would be acquired for constructing the Easton Village Station.

The Easton Village Station site is on Sullivan Street, across the road from Veterans Memorial Park. Local traffic likely uses Sullivan Street to access the park. Temporary delays due to traffic congestion resulting from commuters accessing the Easton Village Station may impact traffic patterns and access to this proximate protected open space. However, peak traffic usage (morning and evening commute times) would not coincide with likely park recreational use (mid-day). Frothingham Park is accessed from Barrows Street or Sheridan Street, neither of which would be directly impacted by the Easton Village Station. Ricker Field is accessed from Main Street, a surface street separated from Sullivan Street by the Stoughton Line. Access to Ricker Field is unlikely to be impacted by use of the Easton Village Station.

Fall River Depot Station

The Fall River Depot Station (Figure 4.10-12) would be a new station constructed along the Fall River Secondary to serve all Build Alternatives. It would be located near the intersection of North Davol Street and Pearce Street in Fall River.

The Fall River Depot Station site is a previously developed parcel that is near five protected open spaces. This site is not within or proximate to any ACECs. No protected open space land would be acquired for constructing the Fall River Depot Station.

Local traffic is unlikely to use the surface streets in the immediate vicinity of the Fall River Depot Station site to access the nearby protected open spaces, all of which are separated from the site by major highways (Routes 138 and 79) or the existing Fall River Secondary, and have better access from other streets. No changes in access to the protected open spaces are expected.

Freetown Station

The Freetown Station (Figure 4.10-13) would be a new station constructed along the Fall River Secondary to serve all Build Alternatives. It would be located along South Main Street in Freetown.

The Freetown Station site is a previously developed parcel that is near the Freetown-Fall River State Forest protected open space. It is not proximate to or within any ACECs. No protected open space land would be acquired for constructing the Freetown Station.

The portion of the Freetown-Fall River State Forest proximate to the Freetown Station site is an isolated parcel, separated from the main body of the state forest by Route 24 and the existing Fall River Secondary. The isolated parcel is also separated from the Freetown Station site by the Fall River Secondary. Access to this isolated parcel is unlikely to be affected by constructing or using the Freetown Station.

King's Highway Station

The King's Highway Station (Figure 4.10-14) would be a new station constructed along the New Bedford Main Line to serve all Build Alternatives. It would be located near the intersection of King's Highway and Tarkiln Hill Road in New Bedford. The intersection would be reconfigured as part of the South Coast Rail project.

The King's Highway Station site is a previously developed parcel that is near two protected open spaces: the Charles S. Ashley School and Brooklawn Park. This location is not within or near any ACEC. No protected open space land would be acquired for constructing the King's Highway Station.

The nearby protected open spaces are a school and a neighborhood park, both with several surface street access options. Commuter automobile traffic to and from the King's Highway Station would be using different routes and generally moving away from, rather than toward, these protected open spaces. And, peak traffic usage (morning and evening commute times) would not coincide with likely park recreational use (mid-day). Access to the protected open spaces would not be impacted by the reconfigured intersection or the King's Highway Station.

North Easton Station

The North Easton Station (Figure 4.10-15) would be a new train station constructed along the Stoughton Line that would serve all Build Alternatives. It would be located at 21 Washington Street in Stoughton, behind the Roche Brothers Shopping Plaza.

The North Easton Station site is an undeveloped parcel that is near Town of Easton Conservation Land, Wedgewood Drive Area, and Stoughton Memorial Conservation Land protected open spaces. It is not within or near any ACECs. No protected open space land would be acquired for constructing the North Easton Station.

Local traffic likely uses Washington Street (Route 138) to access the nearby Easton Conservation Land and the Stoughton Memorial Conservation Land. Temporary delays due to congestion resulting from commuters accessing the North Easton Station may impact access to these nearby protected open spaces. Access to the Wedgewood Drive Area is from alternate routes distant from the station site.

Raynham Park Station

The Raynham Park Station (Figure 4.10-16) would be a new train station constructed along the Stoughton Line that would serve the Build Alternatives. It would be located at 1958 Broadway in Raynham, at the former Raynham Park greyhound dog racing facility.

The Raynham Park site is a developed parcel that is near the Hockomock Swamp WMA-protected open space and partially within the Hockomock Swamp ACEC. No protected open space or publicly owned parcels in the ACEC would be acquired for constructing the Raynham Park Station.

Commuters accessing the Raynham Park Station would use Broadway (Route 138), passing through the former Raynham Park greyhound dog racing facility property. Broadway also provides access to the Hockomock Swamp WMA and ACEC at numerous points distant from the Raynham Park Station site. Temporary delays due to traffic congestion on Broadway may result during peak usage periods, but are unlikely to impact access to the protected open space or ACEC.

Stoughton Station

The relocated Stoughton Station (Figure 4.10-17) would be a new train station that would serve all Build Alternatives. The station would be constructed along the Stoughton Line, west of the existing railroad tracks and north of Brock Street. The site is a previously developed area consisting of commercial/industrial businesses, parking areas, and some undeveloped wooded land.

The Stoughton Station site is privately owned and does not include public open space. The site is proximate to five protected open spaces but is not within or proximate to any ACECs. No protected open space land would be acquired for reconstructing the Stoughton Station.

Local traffic likely uses Park Street, Washington Street, and Cushing Street to access the nearby protected open spaces (Marks Field, Woods Pond, Meads Meadow, Halbran Field, and Lehan Field). These streets are located in the vicinity of the Stoughton Station. Use of these streets by commuters during morning and evening commute times would not coincide with the use of these streets to access to nearby protected open spaces during the mid-day. Given the current, active use of the Stoughton Station for commuter rail service, no additional direct impact to access to nearby protected open spaces from implementing the South Coast Rail project is likely.

Taunton Station

The Taunton Station (Figure 4.10-18) would be a new train station constructed along the Stoughton Line that would serve the Stoughton Alternatives. It would be located near the intersection of East Arlington Street and William Hooke Lane in Taunton.

The Taunton Station site is a previously developed parcel near the Hartshorn Park and Plonka Property protected open spaces. It is not within or proximate to any ACECs. No protected open space land would be acquired for constructing the Taunton Station.

Commuters would likely access the Taunton Station by Arlington Street or Dean Street (Route 44). Temporary delays due to congestion during peak usage periods may result on these roads. Both Hartshorn Park and the Plonka Property are accessed from Longmeadow Road, which intersects Dean Street east of the proposed station location. Traffic congestion near the site is unlikely to extend as far as the intersection with Longmeadow Drive. Additionally, peak traffic usage (morning and evening

commute times) would not coincide with likely park recreational use (mid-day). Traffic patterns near and access to these protected open spaces would not be impacted by use of the Taunton Station.

Taunton Depot Station

The Taunton Depot Station (Figure 4.10-19) would be a new station constructed along the New Bedford Main Line that would serve all Build Alternatives. It would be located at 872 County Street in Taunton, behind the existing Target Plaza.

The Taunton Depot Station site is an undeveloped parcel that is not within or near any protected open spaces or ACECs.

Whale's Tooth Station

The Whale's Tooth Station (Figure 4.10-20) would be a new station constructed along the New Bedford Main Line constructed to serve all Build Alternatives. It would be located near the intersection of Acushnet Avenue and Hillman Street, near the southern terminus of the New Bedford Main line. The City of New Bedford has constructed a parking lot at this site in anticipation of the future station.

The Whale's Tooth Station site is a previously developed parcel that is near the New Bedford Whaling National Historic Park, Fisherman's Wharf Pier #3, State Pier, Clasky/Common Park, and the John Avery Parker School protected open spaces. Several un-named protected open spaces are also proximate to this site. No ACECs are near the Whale's Tooth Station site. No protected open space land would be acquired for constructing the Whale's Tooth Station.

Local traffic may use Acushnet Avenue, Hillman Street, or the nearby Herman Melville Boulevard to access the New Bedford Whaling National Historic Park and the adjoining Fisherman's Wharf Pier #3 or State Pier. Commuter traffic to and from the Whale's Tooth Station may temporarily increase congestion on these roads during high usage periods, causing temporary delays in accessing these protected open spaces. However, peak traffic periods (morning and evening commute times) are unlikely to coincide with use of these protected open spaces (mid-day). No changes in access to the other proximate protected open spaces are expected.

4.10.3.4 Layover Facilities

The Build Alternatives would require midday storage in the Boston area. The mid-day train layover facility is being investigated separately as part of the South Station Expansion Project. Two overnight layover facilities are planned for the Southern Triangle: one each at or near the end of the Fall River Secondary and the New Bedford Main Line. Of the three alternative sites identified in Fall River, the Weaver's Cover East site has been selected as the preferred layover facility site. Of the two alternative sites in New Bedford, the Wamsutta site been identified as the preferred site. This section provides descriptions of each layover facility, an indication of its location in or near any protected open space or ACEC and any parcel acquisition requirements, and a qualitative evaluation of the direct and indirect impacts to these sites potentially resulting from constructing and using these facilities for the South Coast Rail project.

Wamsutta Layover Facility

The Wamsutta site layover facility (Figure 4.10-21) would be constructed along the New Bedford Main Line and would serve all Build Alternatives. It would be located near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main line.

The Wamsutta layover facility alternative location is a previously developed site that is near the Clasky/Common Park and John Avery Parker School. This site is not within or near any ACECs. No protected open space land would be acquired for constructing a layover facility at the Wamsutta site.

Traffic on Hermann Melville Boulevard would pass by the Wamsutta site, but access to the nearby protected open spaces is afforded by other surface streets which are separated from the Wamsutta site by Route 18. No changes in access to the other protected open spaces are expected.

Weaver's Cove East Layover Facility

The Weaver's Cove East site layover facility (Figure 4.10-22) would be constructed along the Fall River Secondary and would serve all Build Alternatives. It would be located in Fall River off of Main Street between the existing Fall River Secondary freight line and Main Street, approximately 2.5 miles from the southern terminus of the Fall River Secondary.

The Weaver's Cove East site is a partially developed parcel that is not located within or near any protected open space or ACECs.

4.10.3.5 Summary of Impacts by Alternative

This section summarizes the direct effects to protected open spaces and ACECs potentially resulting from implementing each of the South Coast Rail project alternatives. The individual components of each element are grouped by alternative, and the potential direct impacts to protected open spaces and ACECs are tabulated.

Stoughton Electric Alternative

The Stoughton Electric Alternative (Figure 1.4-2) would comprise the elements listed in Table 4.10-5, which also summarizes the direct effects to protected open spaces and ACECs potentially resulting from implementing this alternative.

For the Stoughton Electric Alternative, approximately 0.66 acre of land would be acquired from protected open spaces. Legal access to protected open spaces and ACECs would not be significantly impacted by constructing, reconstructing, or using the railroad alignments, stations, or layover facilities. Unauthorized access to protected open space and ACECs along the out-of-service portion of the Stoughton Line would cease.

Table 4.10-5 Summary of Potential Direct Effects to Protected Open Spaces and ACECs from the Stoughton Electric Alternative

Element/Component	Direct Effects: Acquisition Area (acres)	Direct Effects: Number of Parcels
Railroad Alignments		
Northeast Corridor	0	
Stoughton Line	0.66	2
Fall River Secondary	0	
New Bedford Main Line	0	
Stations		
Canton Center	0	
Stoughton	0	
North Easton	0	
Easton Village	0	
Raynham Park	0	
Taunton	0	
Taunton Depot	0	
Freetown	0	
Fall River Depot	0	
Battleship Cove	0	
King's Highway	0	
Whale's Tooth	0	
Layover Facility Alternatives		
Wamsutta Site	0	
Weaver's Cove East Site	0	
TOTAL	**0.66**	**2**

The Stoughton Electric Alternative's impacts to ACEC key functions and values are summarized below:

- **Biodiversity**: The Stoughton Electric Alternative is expected to affect biodiversity in the Hockomock Swamp ACEC areas adjacent to the reconstructed track to a limited degree as a result of increased train traffic that would reduce habitat quality for some wildlife species and would create a partial barrier to wildlife movement. Although partially mitigated by the Hockomock Swamp Trestle, using this railroad bed would affect the connectivity of adjacent habitats and their overall biodiversity value, as described in Chapter 4.14.

- **Farmland soils**: The Stoughton Electric Alternative would impact designated farmland soils that occur at traction power station TPSS-1, located within the Hockomock Swamp ACEC. Construction of this site would impact 1.1 acres of designated farmland soils.

- **Historic and archaeological resources**: The Stoughton Electric Alternative would not affect historic/archaeological properties known to be listed or eligible for listing in the National Register of Historic Places within any ACEC. As a result of installing the overhead catenary system, this alternative would require construction in areas of moderate sensitivity for archaeological resources. This alternative would also require construction (installing pilings for the trestle) in areas of moderate sensitivity for archaeological resources. Additional investigation would be required to determine if any archaeological resources within the Hockomock Swamp ACEC would be affected.

- **Rare species**: The Stoughton Electric Alternative would potentially impact rare species habitat within the Hockomock Swamp ACEC and Pine Swamp, as it crosses two Priority and

Estimated Habitat polygons (PH1392/EH59 and PH1297/EH1077, respectively). This alternative would result in the loss of potential habitat to species known to be present within the Priority Habitats crossed by this segment, including the eastern box turtle (*Terrepene carolina carolina*), Blanding's turtle (*Emydoidea blandingii*), blue spotted salamander (*Ambystoma laterale*), gypsywort (*Lycopus rubellus*), and Hessel's hairstreak (*Callophrys hesseli*). The Hockomock Swamp ACEC provides habitat for at least 13 species listed as rare, endangered, or of special concern by the NHESP. Within the part of the ACEC crossed by the Stoughton Alternative, four state listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, and gypsywort) are known to be present.

- **Water resources**: The Stoughton Electric Alternative would not create a new or additional discharge to the Neponset River and Sprague Pond where the Northeast Corridor passes through the Fowl Meadow and Ponkapoag Bog ACEC. The Hockomock Swamp and Fowl Meadow ACECs would also potentially be impacted from stormwater discharges to Black Brook and the East Branch of the Neponset River, respectively, from the Stoughton Electric Alternative. However, minimal impacts to ACECs from stormwater discharges would result from the project and surface or groundwater resources within the ACECs would not be impaired.

- **Wetlands**: Potential permanent wetland and waterway impacts along the Stoughton Line include the loss of 1.7 acres within the Hockomock Swamp ACEC, out of a total of 8,260 acres of wetlands within this ACEC.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative would comprise the same elements as Stoughton Electric Alternative listed above (shown in Figure 1.4-2) but would not need electrical infrastructure. Table 4.10-6 summarizes the direct effects to protected open spaces and ACECs potentially resulting from implementing this alternative.

For the Stoughton Diesel Alternative, approximately 0.16 acre of land would be acquired from protected open spaces. No publicly owned parcels of ACEC land would be acquired. Access to protected open spaces and ACECs would not be significantly impacted by constructing, reconstructing, or using the railroad alignments, stations, or layover facilities.

The Stoughton Diesel Alternative's impacts to ACEC key functions and values are summarized below:

- **Biodiversity**: The Stoughton Diesel Alternative is expected to affect biodiversity in the Hockomock Swamp ACEC areas adjacent to the reconstructed track to a limited degree as a result of increased train traffic which would reduce habitat quality for some wildlife species and would create a partial barrier to wildlife movement. Although partially mitigated by the Hockomock Swamp Trestle, using this railroad bed would affect the connectivity of adjacent habitats and their overall biodiversity value, as described in Chapter 4.14.

- **Farmland soils**: The Stoughton Diesel Alternative would not impact any mapped areas of designated farmland soils within an ACEC.

Table 4.10-6 Summary of Potential Direct Effects to Protected Open Spaces and ACECs from the Stoughton Diesel Alternative

Element/Component	Direct Effects: Acquisition Area (acres)	Direct Effects: Number of Parcels
Railroad Alignments		
Northeast Corridor	0	
Stoughton Line	0.16	1
Fall River Secondary	0	
New Bedford Main Line	0	
Stations		
Canton Center	0	
Stoughton	0	
North Easton	0	
Easton Village	0	
Raynham Park	0	
Taunton	0	
Taunton Depot	0	
Freetown	0	
Fall River Depot	0	
Battleship Cove	0	
King’s Highway	0	
Whale’s Tooth	0	
Layover Facility Alternatives		
Wamsutta Site	0	
Weaver’s Cove East Site	0	
TOTAL	**0.16**	**1**

- **Historic and archaeological resources**: The Stoughton Diesel Alternative would not affect known archaeological resources within any ACEC. This alternative would require construction (installing pilings for the trestle) in areas of moderate sensitivity for archaeological resources. Additional investigation would be required to determine if any archaeological resources within the Hockomock Swamp ACEC would be affected.

- **Rare species**: The Stoughton Diesel Alternative would potentially impact rare species habitat within the Hockomock Swamp ACEC and Pine Swamp, as it crosses two Priority and Estimated Habitat polygons (PH1392/EH59 and PH1297/EH1077, respectively). This alternative would result in the loss of potential habitat to species known to be present within the Priority Habitats crossed by this segment, including the eastern box turtle (*Terrepene carolina carolina*), Blanding’s turtle (*Emydoidea blandingii*), blue spotted salamander (*Ambystoma laterale*), gypsywort (*Lycopus rubellus*), and Hessel’s hairstreak (*Callophrys hesseli*). The Hockomock Swamp ACEC provides habitat for at least 13 species listed as rare, endangered, or of special concern by the NHESP. Within the part of the ACEC crossed by the Stoughton Alternative, four state listed species (blue-spotted salamander, Blanding’s turtle, eastern box turtle, and gypsywort) are known to be present.

- **Water resources**: The Stoughton Diesel Alternative would not create a new or additional discharge to the Neponset River and Sprague Pond where the Northeast Corridor passes through the Fowl Meadow and Ponkapoag Bog ACEC. The Hockomock Swamp and Fowl Meadow ACECs would potentially be impacted by stormwater discharges to Black Brook and the East Branch of the Neponset River, respectively, from the Stoughton Diesel Alternative.

However, minimal impacts to ACECs from stormwater discharges would result from the project, and surface or groundwater resources within the ACECs would not be impaired.

- **Wetlands**: Potential permanent wetland and waterway impacts along the Stoughton Line include the loss of 1.7 acres within the Hockomock Swamp ACEC, out of a total of 8,260 acres of wetlands within this ACE.

Whittenton Electric Alternative

The Whittenton Electric Alternative (Figure 1.4-3) would comprise the elements listed in Table 4.10-7, which also summarizes the direct effects to protected open spaces and ACECs potentially resulting from implementing this alternative.

For the Whittenton Electric Alternative, approximately 0.66 acre of land would be acquired from protected open spaces. Legal access to protected open spaces and ACECs would not be significantly impacted by constructing, reconstructing, or using the railroad alignments, stations, or layover facilities.

Unauthorized access to protected open space and ACECs along the out-of-service portion of the Stoughton Line would cease.

The Whittenton Electric Alternative's impacts to ACEC key functions and values are summarized below:

- **Biodiversity**: The Whittenton Electric Alternative is expected to affect biodiversity in the Hockomock Swamp ACEC areas adjacent to the reconstructed track to a limited degree as a result of increased train traffic which would reduce habitat quality for some wildlife species and would create a partial barrier to wildlife movement. Although partially mitigated by the Hockomock Swamp Trestle, using this railroad bed would affect the connectivity of adjacent habitats and their overall biodiversity value, as described in Chapter 4.14.

- **Farmland soils**: The Whittenton Electric Alternative would impact designated farmland soils that occur at traction power station TPSS-1, located within the Hockomock Swamp ACEC. Construction of this site would impact 1.1 acres of designated farmland soils.

- **Historic and archaeological resources**: The Whittenton Electric Alternative would not affect known archaeological resources within any ACEC. This alternative, as a result of installing the overhead catenary system, would require construction in areas of moderate sensitivity for archaeological resources. This alternative would also require construction (installing pilings for the trestle) in areas of moderate sensitivity for archaeological resources. Additional investigation would be required to determine if any archaeological resources within the Hockomock Swamp ACEC would be affected.

- **Rare species**: The Whittenton Electric Alternative would potentially impact rare species habitat within the Hockomock Swamp ACEC and Three Mile River ACEC, as it crosses two Priority and Estimated Habitat polygons (PH1392/EH59 and PH261/EH153, respectively). This alternative would result in the loss of potential habitat to species known to be present within the Priority Habitats used by the eastern box turtle, Blanding's turtle and blue spotted salamander along either side of the right-of-way would be impacted by the construction of the railroad. The Hockomock Swamp ACEC provides habitat for at least 13 species listed as rare, endangered, or of special concern by the NHESP. Within the part of

the ACEC crossed by the Stoughton Alternative, four state listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, and gypsywort) are known to be present.

Table 4.10-7 Summary of Potential Direct Effects to Protected Open Spaces and ACECs from the Whittenton Electric Alternative

Element/Component	Direct Effects: Acquisition Area (acres)	Direct Effects: Number of Parcels
Railroad Alignments		
Northeast Corridor	0	
Stoughton Line	0.66	2
Whittenton Branch	0	
Attleboro Secondary	0	
Fall River Secondary	0	
New Bedford Main Line	0	
Stations		
Canton Center	0	
Stoughton	0	
North Easton	0	
Easton Village	0	
Raynham Park	0	
Dana Street	0	
Taunton Depot	0	
Freetown	0	
Fall River Depot	0	
Battleship Cove	0	
King's Highway	0	
Whale's Tooth	0	
Layover Facility Alternatives		
Wamsutta Site	0	
Weaver's Cove East Site	0	
TOTAL	**0.66**	**2**

- **Water resources**: The Whittenton Electric Alternative would not create a new or additional discharge to the Neponset River and Sprague Pond where the Northeast Corridor passes through the Fowl Meadow and Ponkapoag Bog ACEC. The Hockomock Swamp and Fowl Meadow ACECs would potentially be impacted by stormwater discharges to Black Brook and the East Branch of the Neponset River, respectively, from the Whittenton Electric Alternative. However, minimal impacts to ACECs from stormwater discharges would result from the project, and surface or groundwater resources within the ACECs would not be impaired.

- **Wetlands**: Potential permanent wetland and waterway impacts along the Stoughton Line include the loss of 1.7 acres within the Hockomock Swamp ACEC, out of a total of 8,260 acres of wetlands within this ACEC.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative would comprise the same elements as Whittenton Electric Alternative listed above (shown in Figure 1.4-3). Table 4.10-8 summarizes the direct effects to protected open spaces and ACECs potentially resulting from implementing this alternative.

For the Whittenton Diesel Alternative, approximately 0.16 acre of land would be acquired from protected open spaces. Legal access to protected open spaces and ACECs would not be significantly impacted by constructing, reconstructing, or using the railroad alignments, stations, or layover facilities.

Unauthorized access to protected open space and ACECs along the out-of-service portion of the Stoughton Line would cease.

The Whittenton Diesel Alternative's impacts to ACEC key functions and values are summarized below:

- **Biodiversity**: The Whittenton Diesel Alternative is expected to affect biodiversity in the Hockomock Swamp ACEC areas adjacent to the reconstructed track to a limited degree as a result of increased train traffic which would reduce habitat quality for some wildlife species and would create a partial barrier to wildlife movement. Although partially mitigated by the Hockomock Swamp Trestle, using this railroad bed would affect the connectivity of adjacent habitats and their overall biodiversity value, as described in Chapter 4.14.

- **Farmland soils**: The Whittenton Diesel Alternative would not impact any mapped areas of designated farmland soils within an ACEC.

- **Historic and archaeological resources**: The Whittenton Diesel Alternative would require construction (installing pilings for the trestle) in areas of moderate sensitivity for archaeological resources. Additional investigation would be required to determine if any archaeological resources within the Hockomock Swamp ACEC would be affected.

- **Rare species**: The Whittenton Diesel Alternative would potentially impact rare species habitat within the Hockomock Swamp ACEC and Three Mile River ACEC, as it crosses two Priority and Estimated Habitat polygons (PH1392/EH59 and PH261/EH153, respectively). This alternative would result in the loss of potential habitat to species known to be present within the Priority Habitats used by the eastern box turtle, Blanding's turtle and blue spotted salamander along either side of the right-of-way would be impacted by the construction of the railroad. The Hockomock Swamp ACEC provides habitat for at least 13 species listed as rare, endangered, or of special concern by the NHESP. Within the part of the ACEC crossed by the Stoughton Alternative, four state listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, and gypsywort) are known to be present.

- **Water resources**: The Whittenton Diesel Alternative would not create a new or additional discharge to the Neponset River and Sprague Pond where the Northeast Corridor passes through the Fowl Meadow and Ponkapoag Bog ACEC. Potential impacts to the Hockomock Swamp and Fowl Meadow ACECs would result from stormwater discharges to Black Brook and the East Branch of the Neponset River, respectively, from the Whittenton Diesel Alternative. However, minimal impacts to ACECs from stormwater discharges would result from the project, and surface or groundwater resources within the ACECs would not be impaired.

Table 4.10-8 Summary of Potential Direct Effects to Protected Open Spaces and ACECs from the Whittenton Diesel Alternative

Element/Component	Direct Effects: Acquisition Area (acres)	Direct Effects: Number of Parcels
Railroad Alignments		
Northeast Corridor	0	
Stoughton Line	0.16	1
Whittenton Branch	0	
Attleboro Secondary	0	
Fall River Secondary	0	
New Bedford Main Line	0	
Stations		
Canton Center	0	
Stoughton	0	
North Easton	0	
Easton Village	0	
Raynham Park	0	
Dana Street	0	
Taunton Depot	0	
Freetown	0	
Fall River Depot	0	
Battleship Cove	0	
King's Highway	0	
Whale's Tooth	0	
Layover Facility Alternatives		
Wamsutta Site	0	
Weaver's Cove East Site	0	
TOTAL	**0.16**	**1**

- **Wetlands**: Potential permanent wetland and waterway impacts along the Stoughton Line include the loss of 1.7 acres within the Hockomock Swamp ACEC, out of a total of 8,260 acres of wetlands within this ACEC.

Summary of Impacts

Table 4.10-9 provides a summary of the direct effects to protected open spaces and publicly owned parcels in ACECs for all alternatives.

Table 4.10-9 Summary of Potential Direct Effects to Protected Open Spaces and Publicly Owned Parcels in ACECs from All Alternatives

Alternative	Direct Effects: Acquisition Area (acres)	Direct Effects: Number of Parcels
Stoughton Electric	0.66	2
Stoughton Diesel	0.16	1
Whittenton Electric	0.66	2
Whittenton Diesel	0.16	1

The area of protected open space and publicly owned parcels within ACECs required for improving or constructing the alternatives is very similar among the alternatives. For all alternatives, the overall impact would be small relative to the total area of protected open space within the South Coast Rail

project area. All of the alternatives would impact considerably less than 0.01 percent of the total area of protected open space. The Stoughton Electric and the Whittenton Electric Alternatives would impact the same amount of protected open space, 0.66 acre. The Stoughton Diesel and Whittenton Diesel Alternatives would impact 0.5 acre less than their electric counterparts, or 0.16 acre.

4.10.3.6 Mitigation

Mitigation measures are categorized in order of preference: avoidance measures, intended to avoid direct impacts to a resource, are preferred. The second category of mitigation measures, minimization, accepts that direct impacts to the resource would occur, but uses engineering design or management controls to minimize the impact. The final level, mitigation, is used to offset direct impacts by compensating for the impact through some financial or physical analog for the impacted resource. In reality, some combination of these three measures would likely comprise a mitigation plan.

Each of these measures is considered, in turn, for each of the South Coast Rail alternatives in the following sections.

Avoidance

Measures taken to avoid impacts to protected open space and ACECs are described in the following subsections.

Common to All Build Alternatives

Conceptual engineering of the alternative alignments for the South Coast Rail project has focused upon using existing transportation corridors (in-service or out-of-service railroads, and in-service highways) to the extent practical. The rights-of-way established for these corridors do not encroach into protected open spaces. With few exceptions, the engineering design has avoided direct impacts to protected open spaces by delineating limits of work for the Build Alternatives within the rights-of-way.

Since publication of the DEIS/DEIR, acquisition requirements of Article 97-protected properties have been reduced by avoiding or minimizing encroachments into these properties. As listed in DEIS/DEIR Table 4.10-22, Summary of Article 97 Land Acquisition Requirements for All Alternatives, the Stoughton Electric Alternative at that time was projected to require acquisition of 1.09 acres of three Article 97-protected parcels. Based on the current level of design, the Stoughton Alternative would require the acquisition of a small (0.16 acre) portion of one parcel of Article 97-protected property. No other part of the railroad alignment and none of the stations or layover facilities would require acquisition of an Article 97-protected open space.

ACECs (as more geographically broad designations) generally include both disturbed and undisturbed areas, including transportation corridors such as the railroad and highway alignments considered for the South Coast Rail alternatives. Design options to avoid direct impacts to ACECs are therefore extremely limited, and would require extensive impractical re-routing of the alignments.

For the new station and layover facility alternatives, these sites were selected to specifically avoid direct impacts to protected open spaces or ACECs.[23] Expanding or reconstructing existing stations took into consideration adjacent protected open spaces to the extent practicable.

These types of impact avoidance efforts have been made for all alternatives. The following sections summarize the measures taken for each alternative to avoid direct impacts to protected open spaces and ACECs.

Stoughton Alternatives

The Stoughton Alternatives (Electric and Diesel) use existing in-service or out-of-service rail lines for the entire alignment; no new railroad alignments would be included in this alternative. Where the alignments pass through or are immediately adjacent to protected open spaces or ACECs, the limits of work for construction activities within each of these segments lie within the rights-of-way except for in a very few locations as described elsewhere in this section. Incursions into protected open spaces at these locations were minimized to the extent practicable.

The out-of-service segment of the Stoughton Line passes through the Hockomock Swamp ACEC and Pine Swamp protected open space. There are no practicable alternatives for this alignment that do not pass through these areas; however, only one publicly owned parcel within the ACEC would be acquired for a traction power facility for the Stoughton Electric Alternative. Traction power facilities must be sited within certain distances of power sources, based upon engineering constraints, and there are no feasible alternatives for the facility that would be located outside of the Hockomock Swamp ACEC. Sites for other traction power facilities were chosen to avoid any protected open space or ACECs.

The new station and layover facility sites were selected in part to avoid using protected open spaces or ACECs. None of the station or layover facility construction or operation activities would be within protected open spaces or ACECs.

Whittenton Alternatives

The Whittenton Alternatives (Electric and Diesel) use existing in-service or out-of-service rail lines for the entire alignment; no new railroad alignments would be included in this alternative. Where the alignments pass through or are immediately adjacent to protected open spaces or ACECs, the limits of work for construction activities within each of these segments lie within the rights-of-way except for in a very few locations as described elsewhere in this section. Incursions into protected open spaces at these locations were minimized to the extent practicable, as described in the Minimization section.

The out-of-service segment of the Stoughton Line passes through the Hockomock Swamp ACEC. There are no practicable alternatives for this alignment that do not pass through these areas; however, only one publicly owned parcel within this ACEC would be acquired for a traction power facility for the Whittenton Electric Alternative. As described above, traction power facility locations are constrained by engineering considerations, and sites for all other traction power facilities were chosen to avoid protected open spaces and ACECs. It should be noted that the Whittenton Alternatives do not use the southernmost portion of the Stoughton Line, thereby avoiding any impacts to the Pine Swamp protected open space.

[23] EOT. 2009. *Station Siting Report: EOT's Final Recommendations*. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works. Prepared by Vanasse Hangen Brustlin, Inc.: Boston.

The new station and layover facility sites were selected in part to avoid using protected open spaces or ACECs, None of the existing station or layover facility construction or operation activities would be within protected open spaces or ACECs.

Minimization

Measures taken to minimize impacts to protected open space and ACECs are described in the following subsections.

Minimization Measures Common to All Build Alternatives

Minimizing direct impacts to protected open spaces and ACECs can be accomplished by applying engineering controls where encroachments into these areas are inevitable. For example, retaining walls may be constructed in areas of cut or fill to diminish the footprint of a slope that, if left at the angle of repose, would encroach into a protected open space. Some linear resources, such as streams or rivers, may be crossed by replacement bridges with one or two spans rather than the six or eight spans of the original bridge. These types of impact minimization efforts have been made for all alternatives at the conceptual design level evaluated in this section. Further impact minimization may result from final design of the selected alternative. The following sections summarize the measures taken for each alternative to minimize direct impacts to protected open spaces and ACECs.

Minimization Measures for the Stoughton Alternatives

Incursions into one of the two protected open spaces or publicly owned parcels in ACECs would be minimized along the Stoughton Electric Alternative alignment by reducing the footprint of the traction power facilities designated for installation at these locations. The second incursion at the Stoughton Memorial Conservation Land would be necessary in order to accommodate the western edge of the new road and an embankment sloping down from the road bed to the adjacent natural ground surface. Final engineering design, if one of these alternatives is selected, may further minimize, or avoid, these impacts.

Minimization Measures for the Whittenton Alternatives

Since publication of the DEIS/DEIR, refinements to the track design of the Whittenton Alternatives have eliminated the protected open space acquisition for the Whittenton Branch described in Section 4.10.3.2 of the DEIS/DEIR. The Whittenton Alternatives would have the same impacts on protected open space and ACECs as the Stoughton Alternatives. All of the incursions into protected open spaces for the Whittenton Alternatives are the same as those described above for the Stoughton Alternatives. Final engineering design, if one of these alternatives is selected, may further minimize, or avoid, these impacts.

Specific Mitigation Measures

Mitigation measures that may be taken to replace acquired parcels of protected open spaces or publicly owned parcels within ACECs are described below.

Mitigation Measures Common to All Build Alternatives

Current EEA policy requires directly mitigating impacts to publicly owned parcels within protected open spaces or ACECs, or privately owned protected open spaces covered by a conservation restriction, by

protecting an equivalent area (in both function and size). As described in Section 4.10.4.2, this policy applies to acquisition of parcels identified as Article 97 lands. Preferably, impacts to an area within a protected open space would be directly mitigated by acquiring and protecting a parcel adjoining the same protected open space. For example, if 0.5 acre of a protected open space would be acquired for the project, a separate 0.5-acre parcel adjoining that same open space, and providing similar functions as the lost area, would be purchased and given to the open space's owner to replace the lost functions of the area. If an equivalent parcel adjoining the affected parcel is not available, another area of equivalent (or greater) area and ecological value could be identified and acquired for conservation purposes, in accordance with applicable open space plans. In any case, there would be no net loss of the protected open space.

Mitigation Measures for the Stoughton Alternatives

Based upon the impacts indicated by conceptual engineering plans, direct mitigation for protected open spaces impacted by the Stoughton Alternatives would replace the lost functions for protected open spaces in the following municipalities:

Stoughton:

- 0.16 acre of Stoughton Memorial Conservation Land, in and owned by the Town of Stoughton; and

Easton (Electric Alternative only):

- 0.50 acre of conservation land in the Hockomock Swamp ACEC (consisting of 0.50 acre of the Southeast Regional Vocational Tech School sports fields), in and owned by the Town of Easton.

The parcel within the Hockomock Swamp ACEC would be used for a traction power substation for the Stoughton Electric Alternative and it would not be used for the Stoughton Diesel Alternative.

Mitigation Measures for the Whittenton Alternatives

Based upon the impacts indicated by conceptual engineering plans, direct mitigation for protected open spaces impacted by the Whittenton Alternatives would replace the lost functions for protected open spaces in the following municipalities:

Stoughton:

- 0.16 acre of Stoughton Memorial Conservation Land, in and owned by the Town of Stoughton; and

Easton (Electric Alternative only):

- 0.50 acre of conservation land in the Hockomock Swamp ACEC (consisting of 0.50 acre of the Southeast Regional Vocational Tech School sports fields), in and owned by the Town of Easton.

The parcel within the Hockomock Swamp ACEC would be used for a traction power substation for the Whittenton Electric Alternative and it would not be used for the Whittenton Diesel Alternative.

Summary

The South Coast Rail project alternatives would use existing railroad or highway alignments to the maximum extent possible, avoiding or minimizing impacts to protected open spaces. Where property acquisition of protected open spaces is necessary, direct mitigation would be required. Once the preferred alternative is selected and final design completed, such direct mitigation would be negotiated with the affected entity.

4.10.4 Regulatory Compliance

4.10.4.1 Introduction

This section summarizes the South Coast Rail project's compliance with regulations pertinent to open space, including Article 97 of the Massachusetts Constitution, the ACEC program, and Section 7 of the Wild and Scenic Rivers Act. Impacts to protected open spaces are regulated at the federal and state levels by both land management agencies and traditional regulatory agencies. None of the South Coast Rail alternatives require acquisition of any protected open spaces administered by a federal land management agency. Each alternative would require acquisition of protected open space administrated by the state or a municipality, or publicly owned parcels within an ACEC.

4.10.4.2 Article 97 of the Commonwealth of Massachusetts

The right of the Commonwealth's citizens to the quality of life that clean water and undeveloped open space can provide is mandated by Article 97 of the state constitution.[24] Article 97 of the Massachusetts Constitution provides that "[t]he people shall have the right to clean air and water, freedom from excessive and unnecessary noise, and the natural, scenic, historic, and esthetic qualities of their environment; and the protection of the people in their right to the conservation, development and utilization of the agricultural, mineral, forest, water, air and other natural resources is hereby declared to be a public purpose."[25]

The EEA has defined lands subject to Article 97 as "land or interests in … land owned or held by the Commonwealth or its political subdivisions"[26] that protect these interests. It is assumed that the publicly owned open spaces below that have been identified are Article 97 lands subject to the EEA Article 97 Land Disposition Policy.

The goal of the EEA Policy is to ensure no net loss of Article 97 lands. As a general rule, the EEA and its agencies "shall not sell, transfer, lease, relinquish, release, alienate, or change the control or use of any right or interest of the Commonwealth in and to Article 97 land."

Exceptions to this goal are included in the EEA Policy; disposition of Article 97 land is not supported unless exceptional circumstances exist. All other options to avoid use of Article 97 land must be explored and no feasible and substantially equivalent alternatives exist. The requirements for land disposition are

[24] EEA. 2009. "How Is Land Protected?" Commonwealth of Massachusetts, Executive Office of Environmental Affairs website Hhttp://www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Land+Use%2c+Habitats+%26+Wildlife&L2=Land+Use+%26+Conservation&L3=Land+Protection&sid=Eoeea&b=terminalcontent&f=eea_lf_land_protect_how&csid=Eoeea. Accessed 17 June 2009.

[25] *Constitution of the Commonwealth of Massachusetts*, Article XCVII. Approved and ratified on November 7, 1972.

[26] EEA. *1998. Article 97 Land Disposition Policy.* Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Massachusetts Environmental Policy Act Office: Boston.

summarized in the ACEC Program Requirements section, and the application to each alternative is provided in subsequent sections.

Requirements

The policy requires that EEA agencies minimize land disposition occurrences. All Article 97 land disposition proposals are to be coordinated with the EEA, and any Article 97 land disposition that is recommended must be justified and explained to the Secretary of the EEA. Any Article 97 land disposition must be authorized by enacted legislation and approved by all municipal, state, and federal agencies, authorities, or other governmental bodies as required and empowered.

According to the EEA Policy, Article 97 land disposition cannot be supported unless EEA and its agencies determine that exceptional circumstances exist. A determination of "exceptional circumstances" is subject to all of the following conditions being met:

- All other options to avoid the Article 97 disposition have been explored and no feasible and substantially equivalent alternatives exist;
- The disposition of the subject parcel and its proposed use do not destroy or threaten a unique or significant resource;
- As part of the disposition, real estate of equal or greater fair market value or value in use of proposed use, whichever is greater, and significantly greater resource value are granted to the disposing agency or its designee;
- The minimum acreage necessary for the proposed use is proposed for disposition and, to the maximum extent possible, the resources of the parcel proposed for disposition continue to be protected;
- The disposition serves an Article 97 purpose or another public purpose without detracting from the mission, plans, policies and mandates of EEA and its appropriate department or division; and
- The disposition of a parcel is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests therein to the Commonwealth.

To the extent possible based upon readily available information and conceptual engineering plans, an evaluation of each alternative with respect to these six criteria is provided in the following subsections.

Regulatory Compliance of the Stoughton Alternatives

Portions of two protected open spaces and publicly owned land within one ACEC subject to the EEA Policy would be acquired for the Stoughton Alternatives. One of these parcels would be used for traction power substation for the Stoughton Electric Alternative. The Stoughton Alternatives' use of these Article 97 lands complies with the exceptional circumstances criteria as follows:

- **Alternatives**: The Stoughton Alternatives would use existing, active rail lines, as well as new rail lines on currently out-of-service railroad beds, and impacts to Article 97 lands have been avoided or minimized to the extent feasible. The other alternatives under consideration for

the South Coast Rail project (the Whittenton Alternatives) are substantially equivalent and have the same impacts to Article 97 lands.

- **Unique or Significant Resources**: Disposition of the two parcels for the Stoughton Alternatives would not destroy or threaten a unique or significant resource. For each of the parcels, the converted area represents a very small proportion of the overall protected area.

- **Real Estate and Resource Value**: An evaluation of the real estate and resource value of replacement sites would be completed if one of the Stoughton Alternatives is the selected alternative.

- **Minimum Acreage**: The final design of either of the Stoughton Alternatives, if selected, would minimize the acreage necessary for the proposed use and the resources of the parcel proposed for disposition would continue to be protected to the maximum extent possible.

- **Purpose**: The disposition of the parcels for the Stoughton Alternatives would serve a public transportation purpose without detracting from the mission, plans, policies and mandates of EEA and its appropriate department or division.

- **Intent**: If either of the Stoughton Alternatives is selected, the express wishes of the person(s) who donated or sold any acquired Article 97 parcel or interests therein to the Commonwealth would be investigated to ensure that the project complied with the original intent of the donation or sale.

Regulatory Compliance of the Whittenton Alternatives

Portions of two protected open spaces and publicly owned land within one ACEC subject to the EEA Policy would be acquired for the Whittenton Alternatives. As with the Stoughton Alternatives, one of these parcels would be used for traction power substation for the Whittenton Electric Alternative. The Whittenton Alternatives' use of these Article 97 lands complies with the exceptional circumstances criteria as follows:

- **Alternatives**: The Whittenton Alternatives would use existing, active rail lines, as well as new rail lines on currently out-of-service railroad beds, and impacts to Article 97 lands have been avoided or minimized to the extent feasible. The other alternatives under consideration for the South Coast Rail project (the Stoughton Alternatives) are substantially equivalent and have similar impacts to Article 97 lands.

- **Unique or Significant Resources**: Disposition of the two parcels for the Whittenton Alternatives would not destroy or threaten a unique or significant resource. For each of the parcels, the converted area represents a very small proportion of the overall protected area.

- **Real Estate and Resource Value**: An evaluation of the real estate and resource value of replacement sites would be completed if one of the Whittenton Alternatives is the selected alternative.

- **Minimum Acreage**: The final design of either of the Whittenton Alternatives, if selected, would minimize the acreage necessary for the proposed use and the resources of the parcel proposed for disposition would continue to be protected to the maximum extent possible.

- **Purpose**: The disposition of the parcels for the Whittenton Alternatives would serve a public transportation purpose without detracting from the mission, plans, policies and mandates of EEA and its appropriate department or division.

- **Intent**: If either of the Whittenton Alternatives is selected, the express wishes of the person(s) who donated or sold any acquired Article 97 parcel or interests therein to the Commonwealth would be investigated to ensure that the project complied with the original intent of the donation or sale.

Summary

Table 4.10-10 provides a comparison of the Article 97 land acquisition requirements for each South Coast Rail alternative. All of the South Coast Rail alternatives would require a minimal amount of Article 97 land acquisition (0.16 acre).

As described above, compliance with the Article 97 land disposition exceptional circumstances criteria would be completed for the selected alternative once the engineering design is finalized and replacement sites identified.

Table 4.10-10 Summary of Article 97 Land Acquisition Requirements for All Alternatives

	Article 97 Lands	
Alternative	Acquisition Area (acres)	Number of Parcels
Stoughton Electric	0.16	1
Stoughton Diesel	0.16	1
Whittenton Electric	0.16	1
Whittenton Diesel	0.16	1

4.10.4.3 ACEC Program

ACECs are "those areas within the Commonwealth where unique clusters of natural and human resource values exist and which are worthy of a high level of concern and protection."[27] ACECs are designated by the EEA, and the ACEC program is administrated by the Massachusetts Department of Conservation and Recreation. Projects within an ACEC that are subject to state agency jurisdiction or regulations are reviewed with closer scrutiny than other projects to avoid or minimize adverse environmental impacts to these unique areas.

Requirements

According to Commonwealth regulations,[28] all EEA agencies must take action, administer programs, and revise regulations in order to acquire useful scientific data on the ACEC; preserve, restore, or enhance the resources of the ACEC; and ensure that activities in or impacting on the ACEC are carried out so as to minimize adverse effects on seven environmental resources, as addressed in other chapters:

[27] EEA. 2009. 301 CMR 12.03 Areas of Critical Environmental Concern, General Provisions. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs: Boston.

[28] EEA. 2009. 301 CMR 12.12: Effects of Designation. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs: Boston.

- Marine and Aquatic Productivity: Chapter 4.18, *Chapter 91 Compliance and Coastal Zone Consistency*; Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*; Chapter 4.15, *Threatened and Endangered Species*; Chapter 4.16, *Wetlands*; Chapter 4.17, *Water Resources*.
- Surface and Groundwater Quality: Chapter 4.17, *Water Resources*.
- Habitat Values: Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*; Chapter 4.15, *Threatened and Endangered Species*.
- Storm Damage Prevention or Flood Control: Chapter 4.16, *Wetlands*.
- Historic and Archaeological Resources: Chapter 4.8, *Cultural Resources*.
- Scenic and Recreational Resources: Chapter 4.5, *Visual and Aesthetic Resources*.
- Other Natural Resource Values of the Area: Chapter 4.16, *Wetlands* and Chapter 4.11, *Farmland Soils*.

Each alternative's impact on any of the applicable resources at each publicly owned parcel within an ACEC is discussed in the following subsections.

Stoughton Alternatives

One publicly owned parcel within the Hockomock Swamp ACEC in Easton would be acquired for the Stoughton Alternatives:

- 0.50 acre of the Southeastern Regional Vocational Tech School sports fields.

This land would be used for a traction power substation for the Stoughton Electric Alternative. This area represents a small proportion of the ACEC and acquisition would not substantively affect any of the resource areas of concern.

Whittenton Alternatives

One publicly owned parcel within the Hockomock Swamp ACEC in Easton would be acquired for the Whittenton Alternatives:

- 0.50 acre of the Southeastern Regional Vocational Tech School sports fields.

This land would be used for a traction power substation for the Whittenton Electric Alternative. This area represents a small proportion of the ACEC and acquisition would not substantively affect any of the resource areas of concern.

Summary

Table 4.10-11 provides a comparison of the ACEC land acquisition requirements for each South Coast Rail alternative. As described above, none of the ACEC land acquisitions would substantively impact any of the resources of concern for the respective ACECs.

Table 4.10-11 Summary of ACEC Land Acquisition Requirements for All Alternatives

	ACEC Lands	
Alternative	Acquisition Area (acres)	Number of Parcels
Stoughton Electric	0.50	1
Stoughton Diesel	0	0
Whittenton Electric	0.50	1
Whittenton Diesel	0	0

A summary of each alternative's impacts to ACEC key functions is provided below:

- **Biodiversity**: The Stoughton and Whittenton Alternatives are expected to affect biodiversity in the Hockomock Swamp ACEC areas adjacent to the reconstructed track as a result of increased train traffic which would reduce habitat quality for some wildlife species and would create a barrier to wildlife movement. Although partially mitigated by the Hockomock Swamp Trestle, using this railroad bed would affect the connectivity of adjacent habitats and reduce their overall biodiversity value.

- **Farmland soils**: The Stoughton and Whittenton Electric Alternatives would impact designated farmland soils within the Hockomock Swamp ACEC at traction power station TPSS-1. Construction of this site would impact 1.1 acres of designated farmland soils. No farmland soils within an ACEC would be impacted by the Stoughton or Whittenton Diesel Alternatives.

- **Historic and archaeological resources**: None of the alternatives would affect known archaeological resources within any ACEC. The Stoughton and Whittenton Electric Alternatives, as a result of installing the overhead catenary system, would require construction in areas of moderate sensitivity for archaeological resources. The Stoughton and Whittenton Alternatives (both electric and diesel) would require construction (installing pilings for the trestle) in areas of moderate sensitivity for archaeological resources. Additional investigation would be required to determine if any archaeological resources within the Hockomock Swamp ACEC would be affected.

- **Rare species**: For the Stoughton and Whittenton Alternatives, approximately 22 acres of Priority and Estimated Habitat would be impacted within the Hockomock Swamp ACEC. Other species and their habitat may occur within the polygons or within the contiguous ACECs. There are no ACECs crossed by the Southern Triangle.

- **Water resources**: All Build Alternatives would discharge to the Neponset River and Sprague Pond where the Northeast Corridor passes through the Fowl Meadow and Ponkapoag Bog ACEC. Potential impacts to the Hockomock Swamp and Fowl Meadow ACECs would result from stormwater discharges to Black Brook and the East Branch of the Neponset River, respectively, from the Whittenton Diesel Alternative. However, minimal impacts to ACECs from stormwater discharges would result from the project, and surface or groundwater resources within the ACECs would not be impaired.

- **Wetlands**: The Stoughton and Whittenton Alternatives would potentially permanently impact 12.3 acres of waters of the United States along the Stoughton Line, including 1.9

acres of waterbodies/waterways and 10.4 acres of adjacent federal vegetated wetlands, as illustrated in Table 4.16-32. These waterbodies/waterways include the “stream” that diverted from its original course due to blockage and currently flows over the railroad grade south of Raynham Park. Relocating this stream to one side of the right-of-way would create impacts to 204 square feet of vegetated wetlands and over 1.5 acres of waterbodies/waterways to reconstruct the railroad and to construct Raynham Park Station. Mitigation measures would include re-establishing this stream’s original channel, resulting in a beneficial impact.

4.10.4.4 Wild and Scenic Rivers Act

Section 7 of the Wild and Scenic Rivers Act directs federal agencies to protect the free-flowing condition and other values of designated rivers.

Requirements

A determination under Section 7 is required for water resources projects (such as dams) proposed in the bed or banks of a designated river, or on a tributary to a designated river, if the project has federal involvement (e.g., is proposed, authorized, or funded by a federal agency) and, for projects in tributaries, if the project is likely to result in effects to a designated river.[29] These circumstances apply to the South Coast Rail project’s proposed replacement of the four bridges over the Taunton River and, potentially, the bridge over the tributary Mill River because of the requirement to obtain authorization from the Corps for the work under Section 404 of the Clean Water Act. Neither the Weaver’s Cove East Layover Facility nor the Fall River Depot Station are water resources projects and therefore are not subject to this evaluation.

Federally assisted water resources projects (such as bridge replacement) are prohibited only if they would have a “direct and adverse effect” on the values for which a river was added to the National System of Wild and Scenic Rivers. The determination standard for tributaries is applied to projects under the “invade the area or unreasonably diminish” standard. Based on these different standards, the evaluation of impacts to the Taunton River and the Mill River is provided below.

The effects of the project elements on the Taunton River are discussed first, followed by an evaluation of impacts on the Taunton River and Mill River, and discussion of the required consultation with NPS.

Taunton River

The main stem of the Taunton River was designated as a Wild and Scenic River on March 30, 2009.[30] The river’s designation is differentiated in four segments:

- The 18-mile segment from the confluence of the Town and Matfield Rivers to Route 24 in Raynham is designated as a scenic river;
- The 5-mile segment from Route 24 to 0.5 mile below Weir Bridge in Taunton is designated as a recreational river;
- The 8-mile segment from 0.5 mile below Weir Bridge to Muddy Cove in Dighton is designated as a scenic river; and

[29] Interagency Wild & Scenic Rivers Coordinating Council. 2004. Pg. 4.
[30] Omnibus Public Lands Management Act. Public Law 111-11. Section 5003. Taunton River, Massachusetts.

- The 9-mile segment from Muddy Cove to the confluence with the Quequechan River at the Route 195 bridge in Fall River is designated as a recreational river.

The following sections describe the impacts to the Taunton River from the bridges, layover facility, and station.

Bridges

Four bridges over the Taunton River and one bridge over the Mill River (a tributary to the Taunton River) would be replaced for the South Coast Rail project. The bridges are in Taunton (see Figure 4.10-23) and lie within a segment of the Taunton River designated as "recreational." The existing bridges are in deteriorating condition and have insufficient capacity for the expected loads and speeds of the South Coast Rail trains.

The bridges would be replaced with one- or two-span structures. The existing piles would be removed completely or to below grade. New cast-in-place concrete abutments would be constructed behind the existing abutments, which would then be wholly or partially removed to an elevation equal to the river's average seasonal high water elevation. The space between the existing and proposed abutments would be regraded to recreate the river banks on either side of the bridge. For the two-span bridges, a new, pile supported, cast-in-place concrete pier would be constructed in the center of the span. The Taunton River bridges would require approximately 1 year each to construct, while the Mill River bridge would require approximately 6 months to construct. The bridges must be constructed sequentially rather than simultaneously, in order to accommodate ongoing freight service.

The proposed new bridges would improve the navigational capacity and aesthetics along the rivers because of fewer, less visually intrusive pilings. The bridges would improve riparian conditions because they would be designed and constructed to meet Massachusetts River and Stream Crossing Standards, specifically by incorporating space along the river banks to allow wildlife passage. Stormwater runoff during bridge construction and railroad operation would be managed, and water quality in the Taunton and Mill Rivers would not be adversely impacted by stormwater runoff. The new bridges would not alter upland conditions nor change on-site conditions that would alter existing hydrologic or biologic processes. There would be no off-site changes that would affect the river system.

Replacing the bridges over the Taunton and Mill Rivers in Taunton would not adversely impact the recreational designation of the Taunton River in this reach.

Weaver's Cove East Layover Facility

The current level of design of the Weaver's Cove East layover facility incorporates stormwater management features in accordance with regulatory requirements. Constructing and operating a layover facility at the Weaver's Cove East site is not expected to result in any water quality impacts to the Taunton River from construction and stormwater runoff.

The segment of the Taunton River where the Weaver's Cove East Layover Facility is proposed has been designated as a "recreational river area," recognizing its low aesthetic value and developed shoreline. The Weaver's Cove East site is an undeveloped parcel on the east side of the existing active railroad. The shoreline in this segment is developed: a boat yard is north of the site and an industrial facility with a dock for fuel transfers is immediately south. Portions of the layover facility may be visible from the Taunton River, but are not expected to substantively change the visual environment from its current

condition. No impacts to the Taunton River are anticipated that would jeopardize its National Wild and Scenic River recreational designation in this reach.

Fall River Depot Station

The proposed Fall River Depot Station would be 1 mile north of downtown Fall River, on the west side of the Fall River Secondary rail line, between Pearce and Turner Streets on the north and south, respectively, and adjacent to North Davol Street on the west (see Figure 4.10-24).

The station site is visible from adjacent roads and nearby properties, and is within 750 feet of the Taunton River at its closest point, to the west. The intervening space is occupied by the State Route 79 and State Route 138 corridor and properties that have river frontage.

The current level of design of the station incorporates stormwater management features in accordance with regulatory requirements. Constructing and operating a station at the Fall River Depot site is not expected to result in any water quality impacts to the Taunton River; stormwater runoff would discharge to the Fall River sewer system.

This station is envisioned as a multi-modal transportation center with parking facilities. The 8-acre site is close to a dense residential neighborhood and an aging shopping plaza to the east. The station could catalyze redevelopment in that it offers a classic transit-oriented development opportunity that fits with the City of Fall River's plans for redeveloping the waterfront. The site is favorable from an environmental perspective as it was previously developed and does not contain wetlands, vernal pools, or priority habitats for rare species. It is not within the 100-year coastal floodplain.

The station would favorably affect the visual environment by replacing the existing vacant commercial buildings and parking lot with a new canopy, platform, and parking deck with 324 spaces. Its appearance would be an improvement compared to the existing vacant buildings and parking lots.

Constructing and operating the Fall River Depot Station would not detract from the recreational designation of the Taunton River in this reach and could enhance the city's waterfront area.

Taunton River Evaluation

Determining if a project would result in a direct and adverse effect to a designated river requires consideration of aspects of the project potentially impacting the river, and the scope of the evaluation should be consistent with the magnitude and complexity of the project. This section evaluates the potential impact to the Wild and Scenic River designation that may result from the proposed replacement of the Taunton River bridges, as required by Section 7.[31]

1. Define the proposed activity.

The project proponent, MassDOT, proposes to replace four bridges over the Taunton River because the existing bridges are in deteriorating condition and do not meet the safety and performance requirements for the South Coast Rail project. The four bridges are located in Taunton, Massachusetts, as shown on Figure 4.10-23. The bridge replacement project would require 4 years to complete and the bridges would be in operation indefinitely thereafter. The existing multi-span bridges, piers, and abutments would be removed; new abutments and superstructure would be installed. The replacement

[31] Interagency Wild and Scenic Rivers Coordinating Council. 2004. Appendix C: Evaluation Procedure Under "Direct and Adverse."

bridges would be one- or two-span structures. The riverbank would be graded to allow for wildlife passage.

2. Describe how the proposed activity will directly alter within-channel conditions.

The replacement activities would be conducted at the locations of the existing four bridges, largely within the footprint of the existing bridges. The new abutment locations, behind the existing abutment sites, would slightly extend the bridge length. There would be no changes to the active channel location, channel geometry, channel shape, channel form, or water quality parameters. Navigability of the river would be improved by replacing multi-span structures by one- or two-span structures. There would be no adverse impacts to outstanding resources values of the river channel.

3. Describe how the proposed activity will directly alter riparian and/or floodplain conditions.

New abutments would be constructed behind the existing abutments, expanding the riparian area and floodplain slightly. The riverbank at these locations would be re-graded consistent with the slope of the bank up- and downstream from the bridge location. The floodplain would be slightly expanded as a result of replacing the abutments. There would be no adverse impacts to outstanding resources values of the riparian area.

4. Describe how the proposed activity will directly alter upland conditions.

The project would not alter upland conditions. The work would be conducted within the existing railroad footprint, using rail-mounted equipment.

5. Evaluate and describe how changes in on-site conditions can/will alter existing hydrologic or biologic processes.

The project would not adversely alter existing hydrologic or biologic processes. All aspects of the bridge replacement would improve river flow characteristics by replacing the existing multi-span structures with one- or two-span bridges and moving the abutment locations up-bank. Potential impacts to water quality during construction would be managed in accordance with regulatory requirements of the National Pollutant Discharge Elimination System program, specifically described in a project-specific Stormwater Pollution Prevention Plan.

6. Estimate the magnitude and spatial extent of potential off-site changes.

There would be no off-site changes from the bridge replacement activities that would impact the river.

7. Define the time scale over which steps 3-6 are likely to occur.

The bridge construction activities are expected to require 4 years to complete. The bridges would be used indefinitely thereafter.

8. Compare project analyses to management goals.

The bridge replacements are not expected to adversely affect the achievement or timing of achievement of the management goals and objectives for the Taunton River, as described in the *Taunton River Stewardship Plan*.[32]

9. Make the Section 7 determination.

The bridge replacements would improve riparian area and floodplain conditions, and would not affect water quality, outstanding resources values, or the recreational river classification. Replacing and using four bridges over the Taunton River is not expected to result in a direct and adverse effect to the recreational nature of the Taunton River in this reach.

Mill River Evaluation

Determining if a project on a tributary to a designated river would adversely impact the Wild and Scenic River requires consideration of the proposed project's potential to either invade[33] the designated river or unreasonably diminish the scenic, recreational, fish, or wildlife values. This section evaluates the potential for the proposed replacement of the Mill River bridge to impact the Taunton River, as required by Section 7[34]:

The Mill River bridge replacement project activities would be similar to those described above for the Taunton River bridges: the work would be conducted largely within the footprint of the existing bridge and would not adversely impact any aspect of the river.

The evaluation requirement for tributaries is incorporated in this standard[35]:

> "Section 7(a) of the Act provides a specific standard for review of developments below or above or on a stream tributary to a designated river. Such developments may occur as long as the project "will not invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area as of the date of designation . . ." This standard applies to projects outside the river corridor but on the same river or a tributary."

The Mill River bridge is located approximately 1,250 feet upstream of the Mill River's confluence with the Taunton River. Given this distance and the construction activities summarized above, replacing the bridge would not encroach or intrude upon the Taunton River. The Taunton River in this segment is designated as "recreational." Replacing the Mill River bridge at a location 1,250 feet from the Taunton River that is not visible due to the winding river course and heavy vegetation would not diminish the recreational value of the Taunton River.

In summary, the Mill River bridge replacement project would not invade the Taunton River area or unreasonably diminish the recreational value of the Taunton River in this reach.

[32] Taunton River Stewardship Council. 2005. *Taunton River Stewardship Plan, Taunton River Wild & Scenic River Study.* Prepared by the Taunton Wild and Scenic River Study Committee, Southeastern Regional Planning & Economic Development District, and National Park Service—Northeast Region.

[33] "Invade" is defined as "encroach or intrude upon" by the US Department of Agriculture in regulations implementing Section 7, at 36 CFR 297.

[34] Interagency Wild and Scenic Rivers Coordinating Council. 2004. Appendix D: Evaluation Procedure Under "Invade the Area or Unreasonably Diminish.

[35] Ibid. Pg. 29.

Consultation

As explained in Chapter 4.5, *Visual and Aesthetic Resources* (Section 4.5.6.1), consultation with NPS is required. A meeting between MassDOT and representatives from the NPS Wild and Scenic Rivers Program was held in January 2012 to discuss the status of Taunton River as a National Wild and Scenic River. Detailed descriptions of the South Coast Rail project's potential impacts to the Taunton River from the proposed bridge replacement and Fall River Depot Station were requested. These are described above; and a discussion of impacts to the Taunton River, in the context of visual resources, is provided in Chapter 4.5 (Section 4.5.3.3). Further consultation with NPS is anticipated as the project advances through the design process.

4.11 FARMLAND SOILS

4.11.1 Introduction

This chapter discusses the presence of farmland soils that may be affected by the proposed South Coast Rail alternatives and associated stations and layover facilities. Section 4.11.1 provides general information relative to farmland soils, associated regulations, and state agricultural programs; Section 4.11.2 identifies the project study area, lists the farmland soils type, and describes existing farmland soils potentially affected by the South Coast Rail project; and Section 4.11.3 evaluates the specific impacts of each of the proposed alternatives to designated areas of mapped farmland soils. Background information on the proposed project and a summary of each of the proposed alternatives are provided in Chapter 3, *Alternatives*, and in the November 2008 ENF.[1]

This chapter addresses the requirements of the Certificate on the ENF, dated April 3, 2009, issued by the Secretary of the Executive Office of EEA. The Secretary's Certificate on the ENF required that the Draft EIR:

- The DEIR should include cumulative totals for land alteration and impervious area, as well as a breakdown for specific elements of the project such as stations and layover facilities.
- The DEIR should include a comparative analysis of land alteration for the alternatives, which should include a breakdown of the different types and amounts of land altered, for example: forest; woodland; wetland resource area (bordering vegetated wetlands, riverfront, bank, etc.); wetland buffer; priority habitat; previously disturbed area (specify land type/use).

The Secretary of the EAA issued a Certificate on the DEIR on June 29, 2011. No specific requirements for evaluation of farmland soils are included in the Certificate; however, the new Dana Street Station site was evaluated with respect to farmland soils.

Chapter 5, *Indirect Effects and Cumulative Impacts*, evaluates the potential effects of induced growth and cumulative losses of farmland soils in the South Coast region.

4.11.1.1 Resource Definition

Designated farmland soils are comprised of three classes of soils that have been identified by the USDA Natural Resources Conservation Service (NRCS): prime farmland, unique farmland, and farmland of statewide or local importance. These soil classes have been identified as contributing to the agricultural productivity of the country and should be protected from conversion to non-agricultural uses by federal programs.

Prime farmland is defined by the USDA NRCS as "land that has the best combination of physical and chemical characteristics" for agriculture. This includes land with these characteristics used for livestock or timber production, but not land that is already urbanized or used for water storage. Unique farmland is defined as "land other than prime farmland that is used for production of specific high value food and fiber crops," with such crops defined by the Secretary of Agriculture. Farmland of statewide or local

[1] Executive Office of Transportation and Public Works, South Coast Rail Environmental Notification Form, November 2008.

importance is defined as “farmland, other than prime or unique farmland, that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.”

4.11.1.2 Regulatory Context

In 1981, the USDA passed the Farmland Protection Policy Act (FPPA)[2] to ensure that significant agricultural lands are protected from being converted to non-agricultural uses during federal programs. The determination of whether or not farmlands are subject to FPPA requirements is based on soil type and the land does not have to be actively used for agriculture. The FPPA regulates four types of farmland soils:

- Prime Farmland
- Unique Farmland
- Farmland of Statewide Importance
- Farmland of Local Importance

The USDA has adopted a policy of mitigating loss of farmland by any project that uses state funds, requiring the agency to replace the land or pay money into a local fund for preserving farmland. Massachusetts EO 193, Preservation of Agricultural Land, directs all state agencies to mitigate against the conversion of agricultural land to other uses when feasible alternatives are available.

4.11.1.3 State Agricultural Programs

This section provides an overview of the agricultural programs that are available in Massachusetts. Farmlands in southeastern Massachusetts are considered important because they play an important role in the local economy, keeping the taxes down, preventing sprawl, and maintaining the overall quality of life preferred by the local residents.[3]

Massachusetts Agricultural Preservation Restriction Program

The state’s Agricultural Preservation Restriction program (APR) is a voluntary program that encourages farmers to keep their land in active agricultural use. To alleviate development pressures on important pieces of agricultural land, the state provides funds for municipalities to pay an owner the difference between the fair market value and the “agricultural value” of the property in exchange for a permanent deed restriction that proscribes any use that would impair the property’s agricultural viability. Participation in the APR program is competitive, and APR funding is primarily allocated to communities that have demonstrated planning support for agricultural uses through tools such as right-to-farm bylaws and a commitment to smart growth principles.[4]

Almost two thirds of the South Coast region communities[5] along the southern section of I-495 (Bridgewater, Middleborough, Norton, Raynham, Taunton, and Wareham) and roughly one-third of the communities south of I-495, furthest away from Boston, (Fall River and New Bedford and the towns of

[2] United States Department of Agriculture, Farmland Protection Policy Act, 1981, (Public Law 97-98, 7 U.S.C. 4201).
[3] Southeastern Regional Planning and Economic Development District, Regional Open Space Plan, 2008.
[4] Ibid.
[5] This discussion of South Coast region communities reflects the conditions in the original study area during the DEIS/DEIR phase. It is inclusive of portions of the study area associated with alternatives no longer under consideration (i.e., the Attleboro and Rapid Bus Alternatives).

Acushnet, Dartmouth, Dighton, Fairhaven, Lakeville, Marion, Mattapoisett, Rehoboth, Rochester, Seekonk, Somerset, Swansea, and Westport) participate in the APR program. In the northern suburban communities closest to Boston (Attleboro, North Attleboro, Canton, Easton, Foxborough, Mansfield, Sharon, and Stoughton) only one community, Foxborough, participates. Dartmouth, Fairhaven, Norton, Rehoboth, Rochester, Taunton, and Westport all have used the program one or more times since 2000. Communities showing sustained participation in the program—Berkley, Dartmouth, Rehoboth, Rochester, and Westport—are semi-rural, with over 50 percent developable land and low amounts of permanently protected open space. With the exception of Westport, they also have experienced high rates of population growth since 1990. Continued participation in the APR program may allow these communities to protect important agricultural properties from suburbanization trends.

Regional Open Space Plan

A Regional Open Space Plan (ROSP) was developed by a committee of municipal representatives working with the SRPEDD to protect and preserve commonly shared land and resources in the Lower Taunton River Watershed.

As noted in the ROSP, these resources include some of the richest agricultural soils in the Taunton River Basin and some of the best examples of natural, aquatic, and estuarine resources in the region. For example, the riverfront lands along the Taunton River have some of the richest alluvial soils in the Commonwealth, and there are numerous farms along the river within the town of Berkley. Agriculture is the predominant land use in the towns of Berkley, Freetown, and Lakeville.[6] One strategy identified by the ROSP was to acquire and enroll farmland soils into APR programs.

Farm Viability Enhancement Program

The Farm Viability Enhancement Program is a state technical assistance program that works with farmers to provide a business plan for their operations. This program offers farmers financial assistance when they sign a short-term non-development agreement.[7]

Chapter 61A

Chapter 61A is an agricultural and horticultural land classification program designed to encourage the preservation of valuable farmland and promote active agricultural and horticultural land use in Massachusetts. It offers local tax benefits to property owners willing to make a long-term commitment to farming, by allowing agricultural lands of a least 5 continuous acres to be taxed at actual use value rather than at its development potential. In exchange for these benefits, when the land is removed from farming, the city or town in which the land is located is given the right to recover some of the tax benefits and an option to purchase the property if the land is sold or used for any other purpose than raising farm products.[8]

[6] Southeastern Regional Planning and Economic Development District, Regional Open Space Plan, 2008.
[7] Ibid.
[8] Massachusetts Department of Revenue, Division of Local Services Property Tax Bureau's "Taxpayer's Guide to Classification and Taxation of Agricultural/Horticultural Land in Massachusetts" Brochure dated October 1997. Chapter 61A. (http://www.charltontrust.org/Chapter_61A_brochure.htm).

4.11.2 Existing Conditions

4.11.2.1 Regional Overview of Existing Conditions

This section includes a general description of the South Coast Rail study area and lists the farmland soil types that may occur in the study area.[9]

Study Area

The South Coast area of Massachusetts is generally considered the region of southeastern Massachusetts within southern Bristol and Plymouth Counties, bordering on Buzzards Bay or Mount Hope Bay. The farmlands study area includes areas that are outside existing or inactive railroad or highway corridors, where construction could disturb or displace soils used for, or potentially used for, farming. Farmland soils and active farmlands were identified within portions of the proposed stations.

In order to evaluate farmland soils within the South Coast Rail study area, the NRCS soils data available through MassGIS were used to create maps of the alternatives that show the farmland soils at the station sites and a 100-foot buffer from the centerline of each existing and proposed alternative.

Farmland Soil Types

There are a total of 89 soil types that have been identified in Bristol County. Eighteen of these soils are considered prime farmland soils, two are considered farmland soils of unique importance (soil unit symbols 51A and 51B), and eight are considered farmland soils of statewide importance (soil unit symbols 254C, 255A, 255B, 256A, 305C, 306B, 306C, and 311B).

The importance of farmland soils classification is that it identifies the location and extent of the most suitable land for the production of food, feed, fiber, forage, and oilseed crops. This information is useful in the management, maintenance, and productive capacity of agriculture.[10] Table 4.11-1 lists the farmland soils that are identified by the NRCS Soil Survey in Bristol County.

4.11.2.2 Existing Conditions within the Study Corridor

This section lists and describes the farmland soils in areas of each project alternative that are currently undeveloped (station sites) or do not have existing transit infrastructure (rail corridors). All Build Alternatives are located along existing or abandoned right-of-ways that have been previously disturbed for transportation activities. Four of the station sites being proposed include areas that are identified as potentially important agricultural lands. Table 4.11-2 provides a list of proposed stations and whether or not designated farmland soils are present on those sites.

Southern Triangle (Common to All Build Alternatives)

Within the Southern Triangle study area, the Build Alternatives would all utilize existing segments of the right-of-way along the New Bedford Main Line and Fall River Secondary. Because these sections of the project would not incorporate land outside the existing railroad right-of-way, the presence of farmland soils adjacent to the rail right-of-way was not investigated. All Build Alternatives would include designated farmland soils at the proposed Freetown station site, as described below.

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[9] The study area reflects the original study during the DEIS/DEIR phase and includes portions of the study area associated with alternatives no longer under consideration, including the Attleboro Alternative and the Rapid Bus Alternative.

[10] U.S. Department of Agriculture, Natural Resources Conservation Service, Soils (Farmland Classification). Website accessed on February 2009. (http://soils.usda.gov/technical/handbook/contents/part622.html#ex2).

Freetown Station Site—The approximately 18-acre Freetown station site is partially undeveloped and partially developed with an industrial land use. The developed portion is occupied by a self-storage business. The parcels surrounding the proposed station site are mainly forested, with some residential and industrial uses.

The Freetown station site includes areas of prime farmland soils (Figure 4.11-1). Table 4.11-3 lists the soil types, farmland classification, acreage, and percent coverage that are found within the Freetown station site (prime farmland is noted in bold).

Table 4.11-1 Prime and Unique Farmland Soils in Bristol County

Soil Unit	Soil Map Unit Name	Farmland Classification
51A	Swansea muck, 0 to 1 percent slopes	Farmland of unique importance
52A	Freetown muck, 0 to 1 percent slopes	Farmland of unique importance
223A	Scio silt loam, 0 to 3 percent slopes	Prime farmland
230A	Unadilla very fine sandy loam, 0 to 3 percent slopes	Prime farmland
230B	Unadilla very fine sandy loam, 3 to 8 percent slopes	Prime farmland
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	Prime farmland
254B	Merrimac sandy loam, 3 to 8 percent slopes	Prime farmland
254C	Merrimac sandy loam, 8 to 15 percent slopes	Farmland of statewide importance
255A	Windsor loamy sand, 0 to 3 percent slopes	Farmland of statewide importance
255B	Windsor loamy sand, 3 to 8 percent slopes	Farmland of statewide importance
256A	Deerfield loamy fine sand, 0 to 5 percent slopes	Farmland of statewide importance
256B	Deerfield loamy sand, 3 to 8 percent slopes	Prime farmland
258A	Amostown fine sandy loam, 0 to 3 percent slopes	Prime farmland
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	Prime farmland
260B	Sudbury fine sandy loam, 0 to 8 percent slopes	Prime farmland
275A	Agawam fine sandy loam, 0 to 3 percent slopes	Prime farmland
275B	Agawam fine sandy loam, 3 to 8 percent slopes	Prime farmland
276A	Ninigret fine sandy loam, 0 to 3 percent slopes	Prime farmland
305A	Paxton fine sandy loam, 0 to 3 percent slopes	Prime farmland
305B	Paxton fine sandy loam, 3 to 8 percent slopes	Prime farmland
305C	Paxton fine sandy loam, 8 to 15 percent slopes	Farmland of statewide importance
306B	Paxton fine sandy loam, 3 to 8 percent slopes, very stony	Farmland of statewide importance
306C	Paxton fine sandy loam, 8 to 15 percent slopes, very stony	Farmland of statewide importance
310A	Woodbridge fine sandy loam, 0 to 3 percent slopes	Prime farmland
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	Prime farmland
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	Farmland of statewide importance
325B	Newport silt loam, 3 to 8 percent slopes	Prime farmland
345B	Pittstown silt loam, 2 to 8 percent slopes	Prime farmland

The following sections summarize the NRCS soil descriptions of the prime farmland soil found at the Freetown station site.

Merrimac Sandy Loam (254B)[11]**—**This soil is gently sloping, deep, and somewhat excessively drained. It is adjacent to or near large streams and rivers. Areas of this soil are irregularly shaped and range from about 4 to 75 acres. Most are about 15 acres.

Table 4.11-2 Significant Farmland Soils found Within the Proposed Stations

Municipality	Station Name	Prime Farmland	Farmland of Unique Importance	Farmland of Statewide Importance
New Bedford	King's Highway	--	--	--
New Bedford	Whale's Tooth	--	--	--
Freetown	Freetown	✓	--	--
Fall River	Fall River Depot	--	--	--
Fall River	Battleship Cove	--	--	--
Easton/Stoughton	North Easton	✓	--	✓
Easton	Easton Village	--	--	--
Raynham	Raynham Park	--	--	--
Stoughton	Stoughton	--	--	--
Taunton	Dana Street	--	--	✓
Taunton	Taunton (Dean Street)	--	--	--
Taunton	Taunton Depot	--	--	✓

Table 4.11-3 Freetown Station Site Soils

Soil Unit	Soil Map Unit Name	Farmland Classification	Impacted Acres	Percent Coverage
39A	Scarboro muck, 0 to 1 percent slopes	Not prime farmland	1.7	12
70A	Ridgebury sandy loam, 0 to 3 percent slopes	Not prime farmland	0.9	6
71B	Ridgebury sandy loam, 3 to 8 percent slopes, extremely stony	Not prime farmland	3.7	25
73A	Whitman loam, 0 to 3 percent slopes, extremely stony	Not prime farmland	0.5	3
254B	**Merrimac sandy loam, 3 to 8 percent slopes**	**Prime farmland**	**4.0**	**27**
260B	**Sudbury fine sandy loam, 0 to 8 percent slopes**	**Prime farmland**	**0.6**	**4**
310B	**Woodbridge fine sandy loam, 3 to 8 percent slopes**	**Prime farmland**	**2.4**	**17**
446B	Gloucester - Hinckley complex, undulating, very stony	Not prime farmland	0.8	6

This soil is suited to row crops. Droughtiness and an erosion hazard are the main limitations. Incorporating crop residue and manure into the surface layer helps to maintain or increase the organic matter content. The use of winter cover crops reduces surface runoff and helps reduce erosion.

The soil is suited to hay and pasture, especially to drought-resistant plants. The main management concern is the prevention of overgrazing, which causes surface compaction and reduces the density and hardiness of plants. Using proper stocking rates and restricted grazing during wet periods help to maintain plant densities and reduce surface compaction.

[11] USDA Soil Conservation Service. 1981. Soil Survey of Bristol County, Massachusetts (Southern Part).

This soil is suited to trees, but droughtiness causes a high rate of seedling mortality. Reducing plant competition and planting drought-resistant tree species help to reduce seedling mortality.

Sudbury Fine Sandy Loam (260B)[12]—This soil is gently sloping, deep, and moderately well drained. It is near or adjacent to streams and rivers. Areas of this soil are irregular in shape and range from 5 to 40 acres. Most are about 10 acres.

This soil is suited to row crops. The seasonal high water table is the main limitation, and erosion is a hazard. The main management practices include using drainage, using cover crops, and incorporating crop residue and manure into the surface layer to maintain the organic matter content.

The soil is suited to hay and pasture. The main management concerns are the prevention of overgrazing, the prevention of grazing when the soil is wet, and avoiding the use of equipment when the soil is wet, all of which reduce the hardiness and density of plants and cause surface compaction.

Woodbridge Fine Sandy Loam (310B)[13]—This soil is gently sloping, deep, and moderately well drained. It is on the tops and sides of hills. Areas of this soil are irregular in shape and range from 5 to 60 acres. Most are about 30 acres.

This soil is suited to row crops. A seasonal high water table is the main limitation, and erosion is a hazard. The main management practices include using drainage, using cover crops, and incorporating crop residue and manure into the surface layer.

The soil is well suited to hay and pasture. Use of proper stocking rates, deferred grazing, pasture rotation, and restricted grazing when the soil is wet help to maintain the hardiness and density of pasture plants and prevent surface compaction.

Stoughton Alternatives

The presence of farmland soils adjacent to the Northeast Corridor was not investigated because the potential construction associated with these sections of the project would only incorporate a narrow corridor of land adjacent to the existing railroad right-of-way. Because the New Bedford Main Line and Stoughton Line sections of the Stoughton Alternative would not incorporate land outside of the existing railroad right-of-way, the presence of farmland soils adjacent to the rail right-of-way was not investigated. Also, the out-of-service alignment along the Stoughton Line does not require soil analysis because it does not impact natural potentially farmland soils. The Stoughton Alternatives include farmland soils at the proposed Taunton Depot station site and at the North Easton station site. Neither of these sites is currently farmed.

Taunton Depot Station Site

The Taunton Depot station site is located at the rear of Target Plaza on Route 140. Although the site is currently undeveloped, half the site has been cleared while the other half remains forested. The 14-acre site is primarily surrounded by forest and undeveloped parcels to the north, west, and south. Target Plaza, east of the proposed station site, is a relatively new retail site that includes Target, Home Depot, and other stores.

[12] Ibid.
[13] USDA Soil Conservation Service. 1981. Soil Survey of Bristol County, Massachusetts (Southern Part).

The Taunton Depot station site includes areas of farmland soils of statewide importance (Figure 4.11-2). Table 4.11-4 lists the soil types, farmland classification, acreage, and percent coverage that are found within this station site (prime farmlands and farmlands of statewide or unique importance are shown in bold).

Table 4.11-4 Taunton Depot Station Site Soils

Soil Unit	Soil Map Unit Name	Farmland Classification	Impacted Acres	Percent Coverage
9A	Birdsall silt loam, 0 to 3 percent slopes	Not prime farmland	3.7	18
43A	Scarboro mucky loamy fine sand, 0 to 3 percent slopes	Not prime farmland	0.4	2
71B	Ridgebury sandy loam, 3 to 8 percent slopes, extremely stony	Not prime farmland	0.9	4
73A	Whitman loam, 0 to 3 percent slopes, extremely stony	Not prime farmland	0.5	3
245B	Hinckley sandy loam, 3 to 8 percent slopes	Not prime farmland	6.6	32
256A	**Deerfield loamy fine sand, 0 to 5 percent slopes**	**Farmland of statewide importance**	**7.1**	**35**
409B	Charlton - Paxton fine sandy loams, 3 to 8 percent slopes	Not prime farmland	1.1	6

Deerfield Loamy Fine Sand (256A)[14]—This soil is deep, nearly level and gently sloping, and moderately well drained. It is on outwash plains. Slopes are smooth or gently undulating and are 100 to 600 feet long. They are generally less than 3 percent but range to 6 percent in some places. The mapped areas are irregular in shape and are 5 to 40 acres in size.

This soil has fair to poor potential for farming. The soil has good potential for trees and fair potential for open land wildlife habitat. Most acreage is wooded. Some acreage is farmed.

The soil has limited suitability for farming because of the restricted root zone and low available water capacity. The seasonal high water table is the major concern of management. Fertilizer nutrients are quickly leached away by rapidly percolating water. The hazard of erosion is slight. Conservation management includes frequent irrigation and application of fertilizer, addition of organic matter to the plow layer, and use of cover crops.

North Easton Station Site

The North Easton station site is located off Route 138 in Easton. The proposed station site is adjacent to an approximately 10-acre retail plaza anchored by a Roche Brothers supermarket, which includes commercial and offices uses. The station site is currently undeveloped; although some of the site has been cleared, the majority remains forested. New medical buildings have recently been constructed and two additional buildings are planned on the larger site. The North Easton station site is surrounded by forest and undeveloped land.

The North Easton station site includes areas of prime farmland soils and farmland soils of statewide importance (Figure 4.11-3). Table 4.11-5 lists the soil types, farmland classification, acreage, and percent coverage that are found within the North Easton station site.

[14] USDA Soil Conservation Service. 1978. Soil Survey of Bristol County, Massachusetts (Northern Part).

Table 4.11-5 North Easton Station Site Soils

Soil Unit	Soil Map Unit Name	Farmland Classification	Impacted Acres	Percent Coverage
73A	Whitman loam, 0 to 3 percent slopes, extremely stony	Not prime farmland	0.1	1
245C	Hinckley sandy loam, 8 to 15 percent slopes	Not prime farmland	0.2	3
254B	**Merrimac sandy loam, 3 to 8 percent slopes**	**Prime farmland**	**3.3**	**57**
306C	**Paxton fine sandy loam, 8 to 15 percent slopes, very stony**	**Farmland of statewide importance**	**0.9**	**15**
310B	**Woodbridge fine sandy loam, 3 to 8 percent slopes**	**Prime farmland**	**1.5**	**25**

Merrimac sandy loam (254B) and Woodbridge fine sandy loam (310B) were previously described for the Freetown Station site. The following sections summarize the NRCS soil descriptions of the other prime farmland soils found at the North Easton station site.

Paxton Very Stony Fine Sandy Loam (306C)[15]—This soil is deep, moderately sloping, and well drained. It is generally on side slopes of drumloids. Slopes are smooth and convex, and are generally 200 to 400 feet long. Stones are scattered over the surface 20 to 50 feet apart. The mapped areas are irregularly shaped and are 10 to 40 acres in size.

Permeability is moderate or moderately rapid in the subsoil and moderately slow or slow in the substratum. The available water capacity is moderate. The root zone extends to a depth of about 27 inches. Root growth is hampered by the very firm substratum. Reaction is very strongly acid to slightly acid. A seasonal high water table is perched above the substratum for brief periods in winter and spring.

This soil is poorly suited to farming. It is mainly in unimproved pasture. This soil has good potential for trees and for woodland wildlife habitat. Most acreage is in woodland. The soil is not suited to cultivated crops because of stones on the surface. Proper stocking rates, deferred grazing, and pasture rotation are management practices that help to maintain desirable pasture plants. The soil is well suited to trees. Productivity is moderate. Important tree species are northern red oak and eastern white pine.

Prime farmland classification appears to be associated with soil units of the Paxton Series that do not contain significant amounts of stone deposits and are suitable for cropping.

Whittenton Alternatives

The presence of farmland soils adjacent to the Northeast Corridor was not investigated because the potential construction associated with these sections of the project would only incorporate a narrow corridor of land adjacent to the existing railroad right-of-way. Because the New Bedford Main Line, Stoughton Line, Whittenton Branch and Attleboro Secondary sections of the Whittenton Alternatives would not incorporate land outside of the existing railroad right-of-way, the presence of farmland soils adjacent to the rail right-of-way was not investigated. Also, the out-of-service alignment along the Stoughton Line does not require soil analysis because it does not impact natural potentially farmland soils. The Whittenton Alternatives include farmland soils at the proposed North Easton station site and at the Taunton Depot station site as discussed above for the Stoughton Alternatives.

[15] USDA Soil Conservation Service. 1978. Soil Survey of Bristol County, Massachusetts (Northern Part).

Dana Street Station Site

The Dana Street station site comprises approximately 4.9 acres and is located along an existing active freight rail right-of-way. The site is currently a degraded, undeveloped area and consists mainly of bare earth with no vegetation and signs of heavy use by off road vehicles. Several piles of debris are also present. The site is not currently farmed, part of an active farm, or adjacent to an active farm.

The Dana Street station site includes areas of farmland soils of statewide importance (Figure 4.11-4). Table 4.11-6 lists the soil types, farmland classification, acreage, and percent coverage that are found within the site. Deerfield loamy fine sand was described above for the Taunton Depot Station site.

Table 4.11-6 Dana Street Station Site Soils

Soil Unit	Soil Map Unit Name	Farmland Classification	Impacted Acres	Percent Coverage
602	Urban land	Not prime farmland	3.5	72%
32A	Wareham loamy fine sand, 0 to 3 percent slopes	Not prime farmland	1.2	24%
256A	Deerfield loamy fine sand, 0 to 5 percent slopes	Farmland of statewide importance	0.2	4%

Layover Facilities Study Areas

Two preferred rail layover facilities have been identified for the rail alternatives, the Wamsutta Site and Weaver's Cove East. No designated farmland soils are present at the Wamsutta Site in New Bedford or at Weaver's Cove East in Fall River. Since mid-day rail layover facility sites are being separately evaluated as part of the South Station Expansion Project, potential sites have not been identified at this time.

4.11.2.3 Summary of Existing Conditions

The Build Alternatives that are being evaluated would be constructed almost entirely within the footprint of existing or out-of-service rail corridors. As a result, there are no active farms or undisturbed farmland soils associated with the rail or highway corridors included in these alternatives. Designated farmland soils do occur at some proposed station sites.

Most of the station sites would be located within developed and urbanized areas. Four station sites have been mapped with farmland soils present: Freetown, Taunton Depot, North Easton and Dana Street. Soils mapping may vary from field conditions, and is not designed for use as a primary regulatory tool, but may be used as a reference source.[16] None of these sites are currently being farmed. Alternatives that include sites with designated farmland soils include the following:

- Freetown Station Site – all Build Alternatives
- Taunton Depot Station Site – Stoughton Alternatives
- North Easton Station Site – all Build Alternatives

[16] MassGIS-NRCS SSURGO-Certified Soils. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/soi.html.

- Dana Street Station Site – Whittenton Alternatives

None of the above sites are currently farmed, part of an active farm, or adjacent to an active farm, and are not anticipated to be included in an Agricultural Preservation Restriction program or Chapter 61A program.

4.11.3 Analysis of Impacts

4.11.3.1 Introduction

This section evaluates the specific impacts of each of the proposed alternatives to designated areas of mapped farmland soils. It explains the methodology for evaluating direct and indirect impacts to farmland soils, identifies specific locations where impacts to farmland soils would occur under each alternative, summarizes the impacts that would be anticipated under each alternative, and also discusses regulatory compliance measures that would be required once a preferred alternative is selected.

4.11.3.2 Impact Assessment Methodology

Method for Assessing Direct Impacts

Direct impacts are losses that involve open or forested lands, including active farmland, that include designated farmland soils. Direct impacts to farmland soils were calculated using GIS software to overlay the project limits of work on soil units mapped by the available NRCS soil survey as prime farmland, unique farmland, or farmland soils of statewide importance (farmland soils). Activities proposed within soil map units designated as farmland soils that have been previously converted to transportation corridors (road or railroad) or other irretrievable uses were considered to be previously impacted and were ignored for the purposes of this assessment.

The ultimate determination of the severity of a farmland impact is characterized by the total score calculated using the USDA's Farmland Conversion Impact Rating forms AD-1006 (for site impacts) and CPA-106 (for corridor-type impacts). These forms must be completed cooperatively with the NRCS. The forms assess the severity of a farmland impact on a scale of 260 points, with 160 points determined by a site assessment and 100 points determined by the NRCS itself. A score of less than 160 is considered negligible and requires no further analysis. A score between 160 and 200 indicates potential impacts, and the project should consider measures to minimize farmland impacts. A score of 200 or higher indicates a significant impact.

For the purpose of this evaluation, it was conservatively assumed that the NRCS would assign the maximum relative value of 100 for Part V of the Farmland Conversion Impact Rating. This would provide maximum impact ratings between 120 and 134 at the station sites and layover facilities . None of the calculated ratings exceed 200, therefore the impacts would not be considered significant by the NRCS. Draft Farmland Conversion Impact Rating Forms AD-1006 and CPA-106 are provided in Attachment A. After an alternative has been selected for advancement to the Final EIR, forms describing impacts to farmland soils associated with that alternative would be submitted to the NRCS for completion.

Draft forms for sites and corridor segments that would potentially impact more than 2 acres of mapped farmland soils were completed in order to determine the severity of impact. Copies of these forms are included in Appendix 4.11-A.

Method for Assessing Indirect Impacts

Indirect impacts are consequences that occur as the result of an action's direct impact. Indirect impacts, as defined on NRCS Forms AD-1006 and CPA-106, may include reducing or eliminating access to farmland, reducing farmland to a size or configuration that is no longer viable, effects on local farm support services and industries, and proximity to improvements such as water and sewer lines. Indirect impacts were evaluated considering the direct impacts to the farmland, the criteria used in the farmland rating for Form AD-1006 and Form CPA-106, as well as subsequent development or development pressure that may result from the direct impacts.

4.11.3.3 Impacts of Alternatives by Element

This section evaluates the potential impacts to farmland soils associated with the project alternatives that are being advanced for consideration. These alternatives include the No-Build Alternative (Enhanced Bus), Stoughton Alternatives (Electric and Diesel), and Whittenton Alternatives (Electric and Diesel).

No-Build (Enhanced Bus) Alternative

The No-Build Alternative (Enhanced Bus) would consist of enhancing current bus service along existing roads and highways. Three existing park-and-ride facilities would be modified as part of the No-Build Alternative:

- West Bridgewater Park-and-Ride, located near the southwest corner of the intersection of Routes 106 and 24;
- Mount Pleasant Street Park-and-Ride, located on the northwest corner of the intersection of King's Highway and Route 140 in New Bedford;
- Galleria Park-and-Ride, located adjacent to the Silver City Galleria shopping mall in Taunton.

None of these sites are within mapped areas of designated farmland soils. Under the No-Build Alternative, minor modifications are proposed to these existing parking lots that would not disturb additional land. No impacts to farmland soils are anticipated under the No-Build Alternative.

Southern Triangle (Common to All Build Alternatives)

All Build Alternatives would use existing segments of the railroad right-of-way along the New Bedford Main Line and Fall River Secondary (together referred to as the Southern Triangle). Because these sections of the project would not incorporate land outside of existing and active railroad right-of-ways, the presence of farmland soils along these corridors was not investigated. All Build Alternatives include impacts to designated farmland soils at the proposed Freetown station site, adjacent to the Fall River Secondary in Freetown.

Stoughton Electric Alternative

The alignment of the proposed Stoughton Alternative follows a previously developed railroad corridor. Although the rail corridor has been abandoned, the prior alteration of soils and placement of fill materials results in the corridor not being available for farming activities. Minor temporary and permanent impacts may occur within sliver takings immediately adjacent the right-of-way during track reconstruction and re-alignment; however, none of these areas are actively farmed or would constitute

farmable land by themselves. The North Easton station site proposed as part of this alternative would impact mapped areas of designated farmland soils. This station site is located adjacent to the rail corridor in Easton and Stoughton. Impacts at proposed station sites are described below.

Under the Stoughton Electric Alternative, alteration of mapped areas of designated farmland soils would occur at traction power stations located adjacent to the existing right-of-way and constitute the impact to farmland soils associated with this alternative. Four of the ten traction power stations associated with the electric alternative are located on sites that include mapped areas of designated farmland soils. These impacts are identified in Table 4.11-7.

Table 4.11-7 Impacts to Designated Farmland Soils–Stoughton Alternative Traction Power Stations

Municipality	Station Name	Prime Farmland (acres)	Farmland of Unique Importance (acres)	Farmland of Statewide Importance (acres)
Stoughton	Stoughton PS-1	0.3	--	--
Canton	Stoughton SWS-2	0.4	--	--
Easton	Stoughton TPSS-1	0.6	--	0.5
New Bedford	Stoughton TPSS-2	0.8	--	--
	Total	2.1	--	0.5

Traction Power Station TPSS-1 is located within the Hockomock Swamp ACEC. Construction at this site would alter a total of 1.1 acres of designated farmland soils: 0.6 acre of Ninigret fine sandy loam, 0 to 3 percent slopes, a soil designated as a Prime Farmland Soil, and 0.5 acre of Windsor loamy sand, 3 to 8 percent slopes, a soil designated as a Farmland Soil of Statewide Importance. However, this area is not actively farmed.

Figures 4.11-5, 4.11-6, 4.11-7, and 4.11-8 illustrate the areas of mapped farmland soils that would be impacted by these traction power stations. Because all of the proposed traction power stations are less than 2 acres in size, drafts of Form AD-1006 were not completed for these locations.

Stoughton Diesel Alternative

Impacts to mapped areas of designated farmland soils for the Stoughton Diesel Alternative are limited to any minor sliver takings along the existing railroad corridor. The diesel alternative involves 2.6 acres less impact than the electric alternative because no traction power stations are proposed under the diesel alternative.

Whittenton Electric Alternative

The alignment of the proposed Whittenton Electric Alternative follows previously developed railroad corridors along the Attleboro Secondary, Whittenton Branch, and Stoughton Line. Although the Whittenton Branch and portions of the Stoughton Line have been abandoned, the prior alteration of soils and placement of fill materials results in the corridor not being available for farming activities. Minor temporary and permanent impacts may occur within sliver takings immediately adjacent the right-of-way during track reconstruction and re-alignment; however, none of these areas are actively farmed or would constitute farmable land. The North Easton, Taunton Depot and Dana Street station sites proposed as part of this alternative would impact mapped areas of designated farmland soils. The North Easton station site is located adjacent to the rail corridor in Easton and Stoughton. The Taunton

Depot station site is located adjacent to the New Bedford Main Line in Taunton. The Dana Street station site is located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton. Impacts at proposed station sites are described in the section on Stations.

Under the Whittenton Electric Alternative, alteration of mapped areas of designated farmland soils would occur at 10 traction power stations located adjacent to the existing right-of-way and constitute the impact to farmland soils associated with this alternative. With one exception (PS-2), the traction power stations associated with the Whittenton Electric Alternative are the same as those in the Stoughton Electric Alternative and result in the same impacts presented in Table 4.11-7. The location of Whittenton Electric Alternative traction power station PS-2 does not include mapped areas of designated farmland soils. Figures 4.11-5, 4.11-6, 4.11-7, and 4.11-8 illustrate the areas of mapped farmland soils that would be impacted by these traction power stations. Because all of the proposed traction power stations are less than 2 acres in size, drafts of Form AD-1006 were not completed for these locations.

Whittenton Diesel Alternative

Impacts to mapped areas of designated farmland soils for the Whittenton Diesel Alternative are limited to any minor sliver takings along the existing railroad corridor. The diesel alternative involves 2.6 acres less impact than the electric alternative because no traction power stations are proposed under the diesel alternative.

Stations

Four proposed station sites are located in areas with mapped farmland soils. These station sites include Freetown, North Easton, Taunton Depot and Dana Street. Table 4.11-8 identifies proposed station sites that include impacts to designated farmland soils.

Table 4.11-8 Impacts to Designated Farmland Soils–Proposed Station Sites

Station Name	Municipality	Prime Farmland (acres)	Farmland of Unique Importance (acres)	Farmland of Statewide Importance (acres)
Freetown	Freetown	3.0	--	--
North Easton	Easton & Stoughton	6.9	--	0.4
Taunton Depot	Taunton	--	--	5.7
Dana St. Station	Taunton	--	--	0.2

Drafts of AD-1006 (Farmland Conversion Impact Rating) forms for each station site are included in Appendix 4.11-A.

Freetown Station

The Freetown station site is located on South Main Street in Freetown and would serve all Build Alternatives. The South Main Street frontage of the site has been developed for industrial use as a self-storage facility and cellular phone tower. The remainder of the approximately 18-acre site has been cleared of trees, but does not appear to be in agricultural production. Parcels surrounding the proposed station site are mainly forested, with some residential and industrial uses.

The Freetown station site includes areas of prime farmland soils. Mapped areas of designated farmland soils that would be impacted by the development of this station site (3 acres) are shown on Figure 4.11-1. In accordance with the assessment procedure outlined on USDA Form AD-1006, the site scores 128 out of a total of 260 points. This low score indicates that the site has relatively low agricultural value and the conversion of the site would be consistent with the FPPA.

North Easton Station

The North Easton station site is located off Route 138 in Easton and would serve all Build Alternatives. The proposed station site is approximately 8.8 acres in size and is adjacent to a 10-acre retail development that is anchored by a Roche Brothers supermarket. The station site is currently undeveloped and mostly forested. Although some of the site has been cleared, it does not appear to be in agricultural production. New medical buildings have recently been constructed and two additional buildings are planned on the larger site. Other than the commercial and offices uses at the shopping plaza, the site is surrounded by forest and undeveloped land.

The North Easton station site includes areas of prime farmland soils and farmland soils of statewide importance. Mapped areas of designated farmland soils that would be impacted by the development of this station site (7.3 acres) are shown on Figure 4.11-3. In accordance with the assessment procedure outlined on USDA Form AD-1006, the site scores 134 out of a total of 260 points. This low score indicates that the site has relatively low agricultural value and the conversion of the site would be consistent with the FPPA.

Taunton Depot Station

The Taunton Depot station site is located at the rear of Target Plaza on Route 140 and would serve all Build Alternative. Although the site is currently undeveloped, roughly half the site has been cleared of trees. The approximately 14-acre site is primarily surrounded by forest and undeveloped parcels to the north, west, and south. Target Plaza, east of the proposed station site, is a retail site that includes Target, Home Depot, and other stores.

The Taunton Depot station site includes areas of farmland soils of statewide importance. Mapped areas of designated farmland soils that would be impacted by the development of this station site (5.7 acres) are shown on Figure 4.11-2. In accordance with the assessment procedure outlined on USDA Form AD-1006, the site scores 120 out of a total of 260 points. This low score indicates that the site has relatively low agricultural value and the conversion of the site would be consistent with the FPPA.

Dana Street Station

The Dana Street Station site is located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton and would serve the Whittenton Alternatives. The approximately 4.9-acre site is a currently vacant lot that appears to have been in industrial use, although it is zoned for residential use. The area is not currently farmed and is a degraded undeveloped area. The area surrounding the site is densely developed with land uses including commercial, industrial, and residential properties.

The Dana Street station site includes farmland soils of statewide importance. Mapped areas of designated farmland soils that would be impacted by the development of this station site (0.2 acre) are shown on Figure 4.11-4. In accordance with the assessment procedure outlined on USDA Form AD-1006,

the site scores 15 out of a total of 260 points. This low score indicates that the site has relatively low agricultural value and the conversion of the site would be consistent with the FPPA.

Layover Facilities

Two preferred rail layover facilities have been identified and evaluated for potential impacts to mapped areas of designated farmland soils. No designated farmland soils are present at the Wamsutta Street layover site in New Bedford, or at the Weaver's Cove East site in Fall River.

One mid-day rail layover facility is planned for the Boston area, but alternative sites have not been selected. Regardless, it is expected that this facility would not impact farmland soils because it would be in or near an already developed area, and is likely not to be within an area used for agriculture.

4.11.3.4 Summary of Impacts by Alternative

This section summarizes the potential impacts to mapped areas of designated farmland soils for each of the alternatives. No information is currently available about potential impacts to farmland soils at the mid-day layover facility. Based on the conservative assessment used to complete the NRCS forms, no significant impacts are anticipated for designated farmland soils that would be altered by this project. Table 4.11-9 summarizes the impacts for each alternative prior to the addition of potential mid-day layover facility impacts.

Table 4.11-9 Impacts to Designated Farmland Soils by Alternative (acres)

Alternative	Southern Triangle	Northern Element	Stations	Total
No-Build/Enhanced Bus Alternative	--	--	--	0
Stoughton Electric Alternative	--	2.6	16.0	18.6
Stoughton Diesel Alternative	--	--	16.0	16.0
Whittenton Electric Alternative	--	2.6	16.2	18.8
Whittenton Diesel Alternative	--	--	16.2	16.2

Stoughton Electric Alternative

The Stoughton Electric Alternative would result in impacts to 18.6 acres of designated farmland soils. Much of this impact occurs as a result of development of the North Easton station site (7.3 acres). The remaining impacts occur as a result of the traction power stations associated with the electrification of the Stoughton Line and the development of the Freetown station site. One of the traction power stations (TPSS-1) is located within the Hockomock Swamp ACEC and would impact 1.1 acres of designated farmland soils.

Using the USDA scoring system, the impacts to farmland soils along this alternative all received low scores. Such scores indicate that these impacts would not be considered significant under the FPPA, and that mitigation for these losses would not be required.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative would result in impacts to 16 acres of designated farmland soils. This impact is slightly less than the electrification alternative because there are no traction power stations

required along the Stoughton Line under the diesel alternative. The remaining impacts occur due to development of the North Easton and Freetown station sites.

Using the USDA scoring system, the impacts to farmland soils along this alternative all received low scores. Such scores indicate that these impacts would not be considered significant under the FPPA, and that mitigation for these losses would not be required.

Whittenton Electric Alternative

The Whittenton Electric Alternative would result in impacts to 18.8 acres of designated farmland soils, the largest impact to farmland soils of all of the alternatives. Much of this impact occurs as a result of development of the North Easton and Taunton Depot station sites (7.3 and 5.7 acres, respectively). The remaining impacts occur as a result of the traction power stations associated with the electrification of the Stoughton Line and the development of the Freetown station site and the Dana Street Station site. One of the traction power stations (TPSS-1) is located within the Hockomock Swamp ACEC and would impact 1.1 acres of designated farmland soils.

Using the USDA scoring system, the impacts to farmland soils along this alternative all received low scores. Such scores indicate that these impacts would not be considered significant under the FPPA, and that mitigation for these losses would not be required.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative would result in impacts to 16 acres of designated farmland soils. This impact is 2.6 acres less than for the Whittenton Electric Alternative, because no traction power stations would be required for the diesel alternative.

Using the USDA scoring system, the impacts to farmland soils along this alternative all received low scores. Such scores indicate that these impacts would not be considered significant under the FPPA, and that mitigation for these losses would not be required.

4.11.3.5 Regulatory Compliance

Farmland Protection Policy Act

The FPPA, P.L. 9798, authorizes the USDA to develop criteria to identify the effects of federal programs on the conversion of farmland to non-agricultural uses. If it is determined that farmland conversion may involve land protected under the FPPA, formal coordination is required per 7 CFR Part 658. The NRCS reviews potential impacts to farmland to determine if the land qualifies as prime or unique farmland or farmland of statewide importance. Forms AD-1006 and CPA-106, which outline direct and indirect impacts to farmland and assign an impact rating at each location, would be submitted by the project for review and scoring by the NRCS. Impacts with scores less than 160 are considered insignificant, between 161 and 200 potentially adverse, and scores over 200 are considered potentially significant. Scores over 160 may require the project to further assess the implications of the proposed action on the farmland and potentially consider alternatives to further minimize or avoid farmland losses. During the environmental review process, agencies having jurisdiction or special use expertise may provide a letter which may include recommended measures to mitigate project effects.

The NRCS has not been requested to complete a Farmland Conversion Impact Rating for any of the South Coast Rail project alternatives at this time because the impacts are not expected to be significant. Drafts of the NRCS Farmland Conversion Impact Rating Forms AD-1006 and CPA-106 have been

prepared for sites larger than 2 acres where designed farmland soils may be impacted. These forms are included in Appendix 4.11-A. Subject to comments from agencies with jurisdiction or special use expertise concerning important farmland, mitigation measures may be developed as appropriate.

Massachusetts Executive Order 193

EO 193 directs state agencies to avoid conversion of agricultural lands to non-agricultural uses. Three criteria are evaluated to determine if a parcel is considered agricultural land for purposes of EO 193:

- the presence of soil types capable of supporting or contributing to present or potential commercial agriculture
- current and historic use for agriculture, and
- absence of non-farm development

Impacts to mapped areas of farmland soils were evaluated where conversion of previously undeveloped land is proposed under each alternative. Although ten sites are located within mapped areas of farmland soils, none are currently in agricultural production. All non-corridor sites are adjacent to existing rail corridors and public roadways and are located in areas that are at least partially developed and are therefore less suitable for conversion to agricultural usage.

Massachusetts Environmental Policy Act/National Environmental Policy Act

MEPA through the Executive Office of EEA requires that state agencies study the environmental consequences of their actions. This mechanism allows the Massachusetts Department of Agricultural Resources to participate in the review of projects that may detrimentally impact state-owned and privately owned agricultural lands. NEPA similarly identifies impacts to farmland soils as requiring investigation during the environmental review process.

Under the MEPA regulatory thresholds published at 301 CMR 11.03(1) (b) (4), the "*conversion of land in active agricultural use to nonagricultural use, provided the land includes soils classified as prime, state-important or unique by the United States Department of Agriculture, unless the Project is accessory to active agricultural use or consists solely of one single family dwelling*" is a threshold that would require that the project undergo MEPA review.[17]

The Secretary's Certificate on the ENF[18] requested review of agricultural lands that may be impacted by the South Coast Rail project. As discussed previously in this chapter, none of the sites that impact farmland soils resulted in a score greater than 160 on Form AD-1006 or CPA-106. These findings indicate that none of the South Coast Rail alternatives would have a detrimental impact on agricultural lands nor would they convert land from active agricultural use to nonagricultural use.

[17] Massachusetts Environmental Policy Act (301 CMR 11.00: MEPA Regulations).
[18] Executive Office of Transportation and Public Works, South Coast Rail Environmental Notification Form, November 2008.

4.12 HAZARDOUS MATERIALS

4.12.1 Introduction

This chapter discusses the potential presence or release of Oil or Hazardous Materials (OHM) in relation to the alternatives under consideration during their construction and operation.

Potential operational impacts of the alternatives may include spills or releases of OHM. However, spills of diesel fuel or hydraulic fluids as a result of a train derailment are not anticipated to occur. Derailments are an extremely rare event, particularly on tracks that are maintained in good condition.

The spill or release of OHM in the process of constructing the alternatives is an unlikely event, and measures would be required to prevent and control any such spills. The construction contractors would implement a Spill Control Program in compliance with the Massachusetts Contingency Plan (310 CMR 40.0000, the MCP) and MBTA policy. These measures would be employed both at the rail reconstruction sites and station construction sites. The following practices would employed on site to prevent, reduce, and clean up spills.

- All spills would be reported to the MBTA and will be reported to appropriate state and/or federal agency if the reportable quantity is exceeded.
- Spill cleanup material would be kept in any chemical storage area.
- All spills would be cleaned up immediately after discovery.
- A spill report would be prepared after each occurrence.
- An appropriately trained employee involved in day-to-day operations would be identified to be the spill prevention coordinator. Each employee would be instructed to report spills to the spill prevention coordinator.
- An inventory of construction and maintenance materials (and corresponding Material Safety Data Sheets) would be maintained as part of the Storm Water Pollution Prevention Plan (SWPPP) for the project.

While the construction activity itself is unlikely to result in the spill or release of OHM, constructing the South Coast Rail alternatives may require acquisition of properties where oil or hazardous materials may already be present in soils or groundwater, or in existing buildings, potentially under conditions that could constitute a prior release pursuant to the MCP. Construction may also encounter contaminated soils or groundwater, or other OHM, within the railroad rights-of-way. The MCP defines the responsibilities of property owners with regard to oil and hazardous material. Several state and federal regulatory programs also govern the requirements for site remediation, transport of regulated hazardous materials, and potential spills during construction.

Rail beds can be contaminated with OHM from a variety of sources, some of which may be exempt from the reporting requirements of the MCP, as stated in the Secretary's Certificate dated April 3, 2009. However, once the materials are excavated or moved, they may be subject to the MCP or other regulations. The Secretary's Certificate recommended that a detailed pre-characterization of soils be

undertaken as recommended by the MassDEP for the station sites and all areas on the right-of-way where construction or rehabilitation is proposed, and to include a draft soil management plan in the EIR.

The Secretary's Certificate on the DEIR, dated July 29, 2011, did not include any new requirements specific to OHM. However, the relocated Stoughton Station and new Dana Street Station site have been evaluated with respect to the potential for OHM-related impacts.

Several locations along the right-of-way and at station locations may contain or have been confirmed to contain subsurface soil and groundwater contamination; underground storage tanks (USTs), and regulated building materials within the buildings to be demolished. Contaminated sites would require the implementation of response actions, as per the MCP, in conjunction with site construction following property acquisition. Response actions would typically consist of the screening and sampling of soil for laboratory analysis of constituents of concern (COCs) and ultimately risk analysis and potentially risk reduction methods such as off-site export of contaminated soil.

After acquisition of a contaminated property, the new owner would be responsible for its cleanup under the MCP. It is therefore advisable that any hazardous waste properties be identified prior to their purchase since the applicant may qualify as an "eligible person" under the Massachusetts Brownfields Act. An "eligible person" is defined under the Act as an owner or operator who did not own or operate the site at the time of the release and who did not cause or contribute to the contamination at the site. If the applicant were determined to be an "eligible person," it could re-establish MCP deadlines for the submittal of response actions and related reports, referred to as Comprehensive Response Actions. The applicant would be required to complete response actions for the property if the release is to soil only. However, the response actions must be completed for the entire site, which may extend beyond the property boundaries, if the release is for impacts to groundwater and/or surface water. Response actions may need to be continued beyond what is required for station construction, as a permanent solution must be achieved for site closure.

The following provides a summary of each of the proposed Alternatives and describes the potential OHM conditions within the locations that may be affected by the South Coast Rail alternatives. OHM in the vicinity of alternatives, including alignment corridors, station locations, and layover facilities are discussed below.

4.12.1.1 Resource Definition

Recognized Environmental Conditions (RECs), as defined by the American Society for Testing and Materials (ASTM) E1527-05 standard practice (Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process), "means the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws."

In the Commonwealth of Massachusetts, the management of hazardous substance and petroleum products when released into the environment is generally governed by the MCP. Hazardous substances include oil, hazardous material and hazardous waste and are defined as those substances that that may constitute a present or potential threat to human health, safety, welfare, or the environment.

Hazardous materials, as defined in the MCP, include any material in whatever form that, because of its quantity, concentration, chemical, corrosive, flammable, reactive, toxic, infectious or radioactive characteristics, either separately or in combination with any substance or substances, constitutes a present or potential threat to human health, safety, welfare, or to the environment, when improperly stored, treated, transported, disposed of, used, or otherwise managed.

Hazardous wastes are waste materials that, because of their quantity, concentration, or physical, chemical or infectious characteristics, may cause, or significantly contribute to an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health, safety, public welfare or the environment when improperly treated, stored, transported, used or disposed of, or otherwise managed. Oil includes insoluble or partially soluble oils of any kind or origin or in any form, including, without limitation, crude or fuel oils, lube oil, asphalt, insoluble or partially soluble derivatives of mineral, animal or vegetable oils and white oil.

When a hazardous substance impacts (or potentially impacts) an environmental medium, then a release (or threat of release) of OHM is said to occur. As per the MCP, a “release” is defined as “spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment.” A threat of release “means a substantial likelihood of a release of OHM which requires action to prevent or mitigate damage of health, safety, public welfare or the environment which may result from the release.”

As a further refinement of the ASTM E1527-05 definition of RECs, MCP terminology and references are used, since the management of OHM once released in the environment is governed by the MCP.

4.12.1.2 Regulatory Context

Properties with confirmed OHM impacts are generally managed in accordance with the MCP, 310 CMR 40.0000 and associated policies or guidance issued by the DEP. However, depending on the type and concentrations of OHM present at a property, other regulations implemented by the Commonwealth of Massachusetts or the USEPA may apply.

4.12.1.3 Methodology

The Build Alternatives would require construction, including soil removal, within the station, layover facility/right-of-way locations and alternatives. Properties would need to be acquired (in part or in full) for station and layover facility construction. Ballasts, railroad ties, and subsurface soil would need to be removed along existing and out of service railroad tracks. Soil would also need to be removed for the construction of new stations and new rail segments. Several buildings would also need to be demolished.

These activities have the potential to result in the following:

- Encountering contaminated soil or groundwater;
- Disposing of contaminated materials;
- Disposing of solid waste containing lead-based paint, asbestos-containing materials, or other regulated materials such as railroad ties.

- The new owner would become responsible for compliance with the MCP for any property that was acquired for stations, layover facilities, or track construction. Remediation of contaminated "brownfield" sites would be a beneficial effect of the alternatives.

Types of Impacts

Potential impacts at each site were determined based on the type of REC identified through Environmental Site Assessments (ESAs). Since publication of the DEIR/DEIS, the Downtown Taunton Station has been replaced by the Dana Street Station, which is proposed to be located on the east side of the railroad between the alignment and Dana Street. In addition, the Stoughton Station, along with a segment of track leading to the station, would be relocated from the location analyzed in the DEIR/DEIS to the area between Morton Street and Brock Street. Potential contamination associated with property required for the Stoughton Station was identified by a Phase I ESA. Potential contamination associated with the Dana Street Station was identified through an environmental screening, comprised of a literature review of DEP records and a review of historical Sanborn Fire Insurance maps. A detailed description of each REC and potential environmental concern or *de minimis* condition is provided in each of the environmental screenings/ASTM Phase I ESAs prepared for the proposed stations and layover facilities for the alternatives under consideration. Also included in the ESAs, and in the tables provided in the following sections, is the list of state hazardous waste sites and corresponding Release Tracking Numbers (RTNs) on which the RECs are based.

In order to permit a user or purchaser of a property to satisfy one of the requirements to qualify for the "innocent landowner, contiguous property owner, or bona fide prospective purchaser" limitations on the landowner liability protection, it is customary practice to conduct a Phase I ESA on the prospective property. The ESA constitutes "all appropriate inquiry" (AAI) into the previous ownership and uses of the property consistent with good commercial or customary practice. An AAI or ESA is conducted to determine if RECs, defined in Section 4.12.1.1, are likely to be present at the prospective property. Except as identified above, a Phase I ESA was performed for all properties which may be subject to potential acquisition for the South Coast Rail alternatives under consideration, including stations and layover facilities.

ASTM E 1527-05 sets forth a standard practice for determining whether a REC is present. The ASTM Standard Practice includes a review of databases, a site reconnaissance, interviews, and a review of sources such as historic aerial photographs, topographic maps, and Sanborn maps by an Environmental Professional to determine if RECs are present at the property.

Potential impacts were evaluated for each REC identified, based on available information, and classified according to their potential for contamination as either high, medium, or low (discussed below).

Depending on the type of REC, additional investigations may be warranted to assess whether a release has actually occurred. Soils to be excavated may be characterized as part of construction, so as to identify potential COCs that may be encountered. In the event that contamination is identified, response actions would be implemented in accordance with the MCP. The results of an investigation and/or screening could reveal the presence of contaminated media and inform risk assessment.

De Minimis Impacts

The ESA Opinion also includes a section for potential environmental concerns or *de minimis* conditions. Such conditions have less of a potential to impact properties than RECs, and are conditions generally not

subject to extensive regulation. An example of a potential environmental concern or *de minimis* condition would be the potential presence of asbestos-containing materials or lead-based paint, based on the age of the building, which would have to be properly managed during building demolition and would require proper disposal.

Asbestos-containing materials were identified as a potential environmental concern or *de minimis* condition for the majority of the buildings that would need to be demolished to implement the alternatives. Such materials include roof flashing, tiles, and other materials that may be present in the building materials based on the age of the buildings. In addition, lead-based paint, mercury and polychlorinated biphenyls (PCBs) may also be present in the building materials and/or fixtures.

The presence of railroad tracks at or adjacent to proposed stations represents a potential environmental concern or *de minimis* condition common to all stations, as railroad operations can be sources of OHM. Removing ballast, ties or soil along railway corridors would require proper disposal; however, a detailed risk assessment or risk reduction measures may not be required if the material is either statutorily exempt from MGL c. 21E or is consistent with background conditions. The soil exemption may apply only if the soil remains *in situ*. If the material is not exempt from MGL c. 21E and not consistent with background conditions, then appropriate response actions must be performed and a Response Action Outcome (RAO) or Remedy Operation Status (ROS) prepared as a regulatory endpoint.

Beneficial Effects

The alternatives would likely have a positive effect on confirmed areas of soil and groundwater contamination in the proposed station and layover locations. On-site contamination encountered would be assessed and if necessary, remediated prior to and during construction activities as per the MCP. Re-use of as much excavated soil as possible, including impacted soil with concentrations below the applicable MCP standards, is the preferred option and is recommended if a pre-risk assessment screening of the material shows that there are no limitations on risk associated with the current and foreseeable use of the property. Remediation of soil which could not be re-used would most likely consist of soil excavation and off-site disposal.

The following describes the locations where environmental screenings/Phase I ESAs were conducted, the methodology used for these assessments, and the methodology used to evaluate the potential impacts associated with RECs (the potential presence of OHM) at each site.

Environmental Screening/Phase I Environmental Site Assessments Study Area

To assess the potential for encountering OHM during the implementation of the South Coast Rail project, Phase I ESAs or environmental screenings were prepared for station locations and layover facilities associated with the alternatives, including the following.

King’s Highway	North Easton	Taunton Depot
Whale’s Tooth	Easton Village	Dana Street
Freetown	Raynham Park	Wamsutta Layover
Fall River Depot	Taunton	Weaver’s Cove East Layover
Battleship Cove	Stoughton	

Phase I ESAs were performed for properties outside the boundaries of the existing rail alignment that will involve property acquisition or ground disturbance. Phase I ESAs were not performed, however, for most properties within the boundaries of the existing rail alignment. The existing corridors were not evaluated because, due to the nature of land use along rail alignments, it can be assumed that there is the potential for adverse impacts to be present in soils or groundwater in these areas, as railroad operations are common sources of OHM releases, such as semi-volatile organic compounds.

Phase I ESA Methodology

Phase I ESAs were performed as per the ASTM E1527-05 Standard Practice and All Appropriate Inquiries (AAI) pursuant to 40 CFR Part 312. The purpose of the Phase I ESAs is to identify RECs in connection with the properties, to the extent feasible pursuant to the process described in the Standard. The Phase I ESAs were completed using the Standard as guidance. The only major modification to the methodology of the ASTM E1527-05 standard is that a “User” was not identified and therefore not asked to perform tasks to help identify the possibility of RECs in connection with the property. The methodology for the Phase I ESAs included the following:

- A computer database search of federal and state files. The federal databases included the current Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), National Priorities List (NPL), Resource Conservation and Recovery Act (RCRA), Storage and Disposal (TSD), RCRA Generators, and Emergency Response Notification System (ERNS) list. The state databases included the state equivalent CERCLIS list, spills, USTs, Solid Waste Landfills (SWL), and public water supply lists.

- A review of available DEP files to provide more information about reported releases of OHM identified through the database search on or adjacent to the site. Where the DEP files provided additional information regarding past ownership; historic site usage; past usage, storage and disposal of OHM on and adjacent to the subject site and other evidence of potential environmental impacts, such information was documented.

- A review of available municipal and historic files to assist in confirming ownership history and past usage. Resources included tax records, aerial photographs, Health Department records, Building Department records, Fire Department records, Conservation Commission records, and Sanborn fire insurance maps. Where available, the site history review also identified reports of historic spills, disposal areas, or other past releases of OHM on or adjacent to the property.

- A review of previous site documents including ESAs, if applicable and/or available for review.

- A visual site reconnaissance to observe the site for overt evidence of a release or threat of release of oil and/or hazardous materials within interior and exterior portions of the entire property. The uses of adjoining properties are also documented.

- Interviews of past and present owners and occupants, and state and/or local government officials, whenever possible, and documenting information regarding the uses and physical characteristics of the property.

The methodology for conducting environmental hazardous materials screenings for the Whittenton Alternative involved a review of the regulatory databases identified above and a review of historical sources in order to identify past land uses.

REC Impact Criteria

The ASTM Standard requires an opinion regarding the potential for each REC to affect a site. The potential impact for each REC identified was classified as high, medium, or low, based on available information. Criteria used to determine the potential impacts are discussed below.

- RECs that are deemed to have a high potential impact consist of sites such as those with confirmed soil, groundwater, and/or indoor air impacts that either were not reported to DEP or were reported to the DEP and have undergone some type of cleanup or remain an active case. Those properties that have undergone a cleanup and have achieved a Permanent Solution, such as a RAO, are still considered high potential impact due to the fact that changing site use or regulations, construction activities, a DEP audit of the RAO, or identification of new environmental conditions (such as indoor air impacts in nearby structures) could trigger the need to conduct additional assessment and/or remediation activities. Other RECs with high potential impacts are those for which UST installation records exist but for which removal documentation is absent, indicating a likelihood that USTs may be present and those where the historic uses of the property indicate that substantial quantities of OHM were used and could constitute a release of OHM.

- Properties with RECs that are deemed to have a medium potential impact consist of properties such as those with potential sources of OHM with limited or inconclusive information. For instance, a single-walled steel UST which has been removed, but limited or no documentation was available to show that proper sampling was conducted at the time of the UST removal to confirm that the UST did not leak, may be deemed a REC of medium potential impact.

- RECs that have low potential to impact a site include off-site properties where releases have occurred but have been mitigated or USTs where proper documentation is available indicating a release has not occurred, as well as for properties that have more recently installed USTs equipped with leak detection, are double walled, and/or contain overfill protection and spill containment.

4.12.2 Existing Conditions

The following describes RECs and potential environmental concerns relative to OHM associated with the alternatives, beginning with the alignments of rail alternatives followed by those stations located in the Southern Triangle (New Bedford Main Line followed by Fall River Secondary), and proceeding with stations and layover facilities located along the alternatives alignments. The conclusions of the Phase I ESA that was previously performed for the Stoughton Alternative right-of-way is provided at the end of this discussion. It should be noted that the presence of railroad tracks at or adjacent to a site is identified as a potential environmental concern common to all stations and corridors, as railroad operations are often sources of OHM.

4.12.2.1 Rail Alignments

Stoughton Alternative

Stoughton Alternative Right-of-Way

As part of a previously prepared Phase I ESA for the Stoughton Alternative, the MBTA examined the right-of-way between Canton Junction and Weir Junction in 1998. Database searches were also evaluated between Canton Junction to Stoughton Station in January 2000.

Based on the conclusions of the 1998 Phase I ESA, the following release sites may impact the Stoughton Alternative right-of-way. These sites include Cohen Property, General Cable Corporation, North Easton Historical Industrial Avenue, and Cyn Environmental. A brief description of each property is included below.

- The Cohen Property, located in Taunton, was listed as a “not proposed CERCLIS” site. This site was comprised of scattered fill consisting of automobile parts, coal slag, scrap metal, and construction debris. Analytical results indicated the presence of six VOCs, PCBs, and inorganic compounds above detectable concentrations in soil. The City of Taunton has developed a reuse program with the EPA to use a portion of the site for Department of Public Works storage. The groundwater flows to the east toward Ingell Street. Groundwater contaminants are consistent with the soil analytical results.

- General Cable Corporation located in Taunton is listed for two spills and releases of No. 4 and No. 2 fuel oil. This site is also listed as the prior location eight USTs, now removed, and as a RCRA Small Quantity Generator.

- North Easton Industrial Avenue is a potential environmental concern due to the historical use of the properties since the early 1900s.

- Cyn Environmental Services, located in Stoughton, is listed as Adequately Regulated outside of the MCP. Cyn is regulated by RCRA guidelines and is a RCRA Small Quantity Generator with several spills listed for petroleum products.

In January 2000, the MBTA performed an additional environmental database search for the Stoughton Alternative from Canton Junction to Stoughton Station. Four potential environmental concerns were identified from the database reports. Additional information was obtained from the DEP for sites which are listed, including the Canton Landfill on Pine Street and three state listed hazardous waste sites. Information from the DEP on the Canton Landfill indicated that groundwater contamination was migrating away from the railroad and does not pose a concern to the right-of-way. The three state-listed hazardous waste sites include a Texaco gasoline station at 731 Washington Street, the Canton Department of Public Works facility, and the Lamb Company at 85 Jackson Street. All three sites were reviewed and determined not to have an environmental impact on the right-of-way due to the distance or remedial actions undertaken at these sites.

Whittenton Alternative

Whittenton Branch

The Whittenton Branch consists of approximately 3.4 linear miles of inactive railroad right-of-way that is 66 feet in width and is located between Whittenton Junction (West Britannia Street in Taunton) and extending northeast toward Raynham Junction (the intersection of Broadway and Center Street in Raynham) (Figure 4.12-1). According to aerial photographs and reports that were reviewed for the Phase I ESA, the site appears to have not been used as a railroad since at least 1950. The last known rail use along the Whittenton Branch was in 1958. The majority of the site is unpaved and unused, with the exception of trespassers. A small section of the right-of-way, located to the south of Whittenton Street, is used as a paved access roadway for the nearby Aggregate Industries facility.

Based on the tasks conducted for the Whittenton Bypass Phase I ESA, four RECs and five potential environmental concerns were identified and are described below.

REC #1–Transformer Oil Releases on Adjoining Property, RTN 4-18532—On July 10, 2004, a sudden release of approximately 590 gallons of transformer oil occurred at the Parkman Construction site (also referred to as Dyecraftsmen, Inc.), located at 437 Whittenton Street. This release site is located adjoining and to the west of the subject site and was assigned RTN 4-18532 by the DEP. The fire department records indicated that oil may have migrated to catch basins and adjacent asphalt surfaces. The DEP records indicated that a Class A-2 RAO was submitted to the DEP on July 15, 2005, indicating that a Permanent Solution was achieved; however, contamination was not reduced to background. The RAO report indicated that historical operations may have led to additional transformer oil releases that should be addressed and managed as separate releases. The potential migration of this transformer oil release, as well as indications of historical transformer releases, constitutes a REC with a medium potential impact.

REC #2–Historic Use of Adjoining Property as Industrial Manufacturing—According to historical reports, the adjoining property located at 437 Whittenton Street was used for industrial processes for over 100 years. The property was initially used in the late 1800s and early 1900s as a cotton mill, which included the treating and dying of materials. As indicated by UST records and historical maps, these industrial processes likely used large quantities of OHM including fuel oil, machining oil, dye, and bleach. Although no historical documented releases (other than REC #1 described above) were identified in connection with this property, given the industrial history and close proximity to the site, the potential presence of OHM is considered to be a REC with a medium potential impact.

REC #3–Indication of Significant Historical Dumping—Significant dumping was observed in the wetland area along Segment 1 of the right-of-way consisting of primarily used tires, but also including an old heating oil tank, an oven, car doors, five gallon buckets, a gas can, and other trash. The dumping was identified as an environmental concern given the type and magnitude of discarded materials, including OHM storage containers and at least 50 tires. This dumping has occurred in a wetland habitat and, therefore, has been identified as a REC with a medium potential impact.

REC #4–Central Oil Company, 728 Broadway, Raynham, RTN 4-16976—A kerosene release was identified at the Central Oil Company, with an address of 728 Broadway, Raynham that was reported to the DEP on April 1, 2002.

RTN 4-16976 was assigned to the release. The current facility status for this site is classified as Tier 1D, where the responsible party fails to provide the required submittal to the DEP by a required deadline. During the site reconnaissance, several large aboveground storage tanks were observed at the Central Oil Company facility, located immediately to the east of the right-of-way. The groundwater directional flow at the facility is not known. These tanks and secondary containment appeared to be in below average condition; however, this was not confirmed, as the Central Oil Company facility was not accessed during this site reconnaissance. Given these observations, the release history, the Tier 1D status and the close proximity to the site, the release and observations associated with the facility have been identified as a REC with a high potential impact.

Potential Environmental Concerns—The Whittenton Branch has five potential environmental concerns, including the following.

- During the site reconnaissance, tires, televisions, piles of fibrous material, and other miscellaneous debris were observed in a wooded area of the site. The source of the material was not determined, although some of the debris was identified as household goods and other material possibly derived from an industry using fibrous materials. The disposal of this material on the site is of potential concern because the nature of the debris is unknown and could potentially contain contaminants that would release to the surrounding environment.

- Three leaking underground storage tank sites located between 2,000 and 3,000 feet to the east of Segments 3 and 4 of the site (see Figure 4.12-1) were identified and are listed below:

    - Pop's Service Station, 212 Broadway, Taunton;

    - Broadway Gulf (Sunoco) Station, 225 Broadway, Taunton;

    - Mystic Gas & Properties, 242 and 252 Broadway, Raynham.

- Local groundwater flow direction is reportedly toward the south; however, there are also indications that a municipal public water supply well field is drawing groundwater towards the west. Each of these three properties has a history of leaking underground storage tanks and related releases of petroleum. Given the proximity to the site and the anticipated groundwater directional flow, these properties are not likely to impact the site but pose a potential environmental concern.

- Historical gravel pits and current observed stump dump operations currently overlap the right-of-way. Piles of wood and loam were observed across several acres of land. No solid waste permit or other listing for this operation was identified during this assessment.

- Miscellaneous debris and an old abandoned truck were observed outside of a horse barn and a cart path connecting the horse barn property to the site, situated along Segment 4 (see Figure 4.12-1). The debris and contents of the horse barn could be a source of OHM.

- A Taunton Municipal Light Plant substation is located adjacent to the site at the southwest portion of Segment 1 (see Figure 4.12-1). There was no indication of spills or releases at the substation and there was no labeling indicating the presence of PCBs on the electrical equipment. However, the operation of this equipment adjacent to the site has the potential to release transformer oil and other OHM onto the site.

A portion of the Whittenton Branch near Prospect Hill Pond is adjacent to a construction and demolition (C&D) debris disposal facility that has encroached onto the railroad right-of-way. A limited review was conducted to evaluate fill material reportedly present on the right-of-way for the presence of OHM. The review is summarized below; a full report is provided in Appendix 4.12-A, with figures showing the area and site features.

New England Recycling, Inc. of Taunton stores the C&D debris at the Raynham Facility, which abuts the railroad right-of-way and has an address of 138 (Rear) Broadway in Raynham. Disposal of C&D debris on the railroad right-of-way is not an authorized use of the land.

The following materials are permitted for storage at the Raynham Facility: post-consumer asphalt shingles (non-asbestos containing materials), pre-sorted asbestos/brick/concrete rubble, wood waste, sand, and gravel. These materials were observed on-site, in addition to minor amounts of debris including buckets, plastic bags, wire, and rebar. The solid waste/debris noted does not appear to constitute a release of OHM to the environment as defined by the Massachusetts Contingency Plan (310 CMR 40.00).

The right-of-way is currently occupied by what appears to be material containing stumps, compost, sand, gravel, boulders, and minor amounts of solid waste and debris. The disposal facility operator has indicated that this material is frequently relocated and new material brought into the site and would be relocated at the request of MassDOT.

4.12.2.2 Stations

Southern Triangle

Battleship Cove Station Site

The Battleship Cove Station site is located on a portion of land east of Water Street and west of Route 138 in Fall River, Massachusetts with an address of 24 Ponta Delgada Boulevard (Figure 4.12-2). According to the property field cards obtained from the Fall River, Massachusetts tax assessor's database, the site consists of a portion of two parcels. The two parcels total 0.779 acre; however, only approximately 0.33 acre comprise the site. The property is currently occupied primarily by the "Portas da Cidade" or "Gates of the City" monument, which includes a fountain, flags, and a grassy area. The majority of the site consists of an asphalt paved driveway, concrete sidewalk, and concrete memorial, which was constructed in 2005. The area surrounding the asphalt driveway consists of landscaped grass.

Based on the tasks conducted for the Battleship Cove Station Phase I ESA, two RECs and no potential environmental concerns were identified. The RECs are described below.

REC #1–Historical Use of the Adjoining Properties—As early as 1888, Sanborn maps indicate that the property adjoining the site to the north at 84 Anawan Street was used as a manufactured gas plant, referred to as the Fall River Gas Works. The Fall River Gas Works at the time housed iron gas holders and a coal house. A Sanborn map from 1905 shows an addition of a crude oil tank and "gasometer" to the gas manufacturing property, as well as the new ownership by Borden & Remington chemical storage of a property immediately to the northeast of the site at 115 Anawan Street. A gas tank on the Borden & Remington property was also constructed and abutted the northwestern corner of the site. The 1933 map showed that up to 15 gas "caustic" materials storage tanks were also present on the Borden &

Remington property at least through 1976. The "empty oil tank" adjoining the northeast corner of the site is currently present at the New England Gas Company property.

According to the computer database report, ten 10,000-gallon USTs were removed from a property located at 115 Anawan Street, which is north of the site. In addition, two USTs (one 5,000-gallon gasoline and one 2,000-gallon diesel) were removed from the New England Gas Company with an address of 84 Anawan Street. It is not known if contamination was encountered at the time of the UST removal. In addition, the general practices at the properties of gas manufacturing and chemical storage could have contributed to environmental impacts at the site.

Land to the west, which is currently owned by Borden & Remington Corporation, has also been used for industrial purposes as early as the mid-1800s. The 1933 Sanborn map indicates that the American Printing Company was located at the property until the Firestone Rubber & Latex Company began its operations in approximately 1970. Numerous storage tanks can be seen on these properties from the Sanborn maps. In addition, the property is currently used by a manufacturer of latex and rubber.

The historical use of the adjoining properties including numerous storage tanks containing OHM is considered a REC with a medium potential impact due to the potential for releases to have occurred over the past 150 years of industrial use and these impacts could potentially migrate and affect the quality of site media.

REC #2–Analytical Results from Previous Environmental Report—A Limited Phase II Environmental site Assessment (Phase II) was completed for the site in November 2001. During Phase II investigation, soil samples submitted for laboratory analysis indicated concentrations of several polynuclear aromatic hydrocarbons (PAHs) and lead above the Reportable Concentrations (RCS-2) representing concentrations that may be indicative of urban fill. Based on the results from the Phase II investigation, the soil could currently contain contamination above the applicable standards. The environmental impacts discovered on the site are considered a REC with a high potential impact.

Fall River Depot Station Site

The Fall River Depot Station site is located southeast of the intersection of Davol and Pearce Streets and consists of numerous parcels with eight addresses totaling approximately 5.3 acres (Figure 4.12-3), which are described as follows.

- 825 Davol Street–This northwestern portion of the site consists of a retail discount flooring warehouse with an associated asphalt driveway and storage trailer. This area also encompasses another small vacant parcel with no address (Parcel 0020) which is owned by the City of Fall River.

- 775 Davol Street–This western central portion of the site contains the remnants (roof, metal side supports, and concrete pad) and associated paved surfaces of a former factory building and is surrounded on all sides with chain-link fencing.

- 61 Pearce Street–This northeastern portion of the site is occupied by a brick warehouse building used by a painting company and an electric and alarm company.

- 390 Davol Street–The eastern central portion of the property along the railroad tracks is elevated and consists primarily of a vacant, gravel and grassy area.

- 753 Davol Street and 175 Bayles Street–The central and eastern portions of the property consist of several buildings, including a brick warehouse, and associated paved parking, that are currently being used by Gemco, an electrical and mechanical contractors business.

- 729 Davol Street–the western central portion of the site consists of a cinder block building, referred to as Jimmy's Tire that is being used as a vehicle repair garage and tire sales facility with associated paved parking.

- 713 Davol Street–the western central portion of the site consists of a multi-family residence in the front near Davol Street and another multi-family residence and associated auto detailing business behind the front residence, referred to as Auto Accent.

- 697 Davol Street–the southernmost portion of the site consists of a restaurant referred to as Davol Street Station Seafood Restaurant & Pub with associated paved parking to the south of the restaurant building. A grassy area is located to the east of the restaurant and parking area along the railroad tracks and slopes upward to the north to a small shack and picket fence.

- Based on the tasks conducted for the Fall River Depot Station Phase I ESA, five RECs and two potential environmental concerns were identified and are described below.

REC #1–Analytical Results from Previous Subsurface Investigations—As part of the Phase II subsurface investigation performed in 2001, a total of 14 hollow-stem auger soil borings were advanced at the site, with eight of the borings being completed as groundwater monitoring wells. Petroleum contamination was encountered in three soil borings at depths ranging from 26 to 34 feet, which is consistent with the groundwater interface. Coal, coal ash, and slag were observed in the fill materials at one soil boring. Asphalt and brick were observed in the fill materials at four of the soil borings. Groundwater samples were also collected from the monitoring wells. Groundwater samples from two wells were observed to have a sheen and distinct petroleum odor.

Analytical results for soil collected from three soil borings showed concentrations in excess of the Reportable Concentration (RCS-1) thresholds, as per the MCP, for volatile petroleum hydrocarbons (VPH). Two samples collected from two soil borings showed concentrations in excess of PAH Reportable Concentrations.

Groundwater samples collected from two on-site monitoring wells showed VPH and extractable petroleum hydrocarbon (EPH) concentrations above the MCP Reportable Concentrations (RCGW-2).

Soil and groundwater concentrations in excess of applicable MCP Reportable Concentrations constituted a potential 120-day release notification obligation to DEP in accordance with the MCP. It appears notification was not performed as the site is not listed on the EDR or DEP databases as having a release. The exceedances of VPH and PAH in soil and VPH and EPH in groundwater above the applicable Reportable Concentrations is considered a REC with a high potential impact.

REC #2–Previous and Current Existence of USTs—A geophysical survey performed on the site in 2001 using ground penetrating radar as part of the Phase II subsurface investigation revealed three potential USTs at the site.

The Fall River Fire Department records show that a 2,000-gallon No. 2 fuel oil UST was previously located at the site at 61 Pearce Street beginning in 1948 until at least 1972. A UST removal permit was not provided; therefore, the UST may still be present at the site. In addition, for the property located at 753 Davol Street, a 1,000-gallon No. 2 fuel oil UST is listed as being present in 1948 and 1976. UST removal permits were provided for two 1,000-gallon No. 2 fuel oil USTs which were removed on March 17, 2009. According to the removal permits, a Licensed Site Professional (LSP) was on the site during the UST removals. Also for the 753 Davol Street property, two 4,000-gallon gasoline USTs were removed on December 2, 1998. It is not indicated on the removal permits if contamination was encountered during the removal; therefore, impacted soil, if encountered during the UST removals, may still be present.

A historic Sanborn map from 1950 showed that a gasoline filling station was located on the northwestern corner of the site that contained two gasoline USTs. According to Building Department records, a gasoline filling station was also constructed at the 753 Davol Street property in 1940. No UST removal permits were provided by the Fall River Fire Department. Therefore, the USTs may still be present at the site which constitutes a REC with a high potential impact.

REC #3–Historic Use of Site Properties—A foundry was located in the northeastern portion of the site beginning in the late 1890s. Two gasoline filling stations were located on the northwestern and center portions of the site in the mid-1900s. The northwestern portion of the site was also was previously used as a junk yard and for the storage of vehicles and industrial equipment. In addition, a steel manufacturing company was located in the center portion of the site from the early 1900s until the 1980s. The center portion of the site also appeared to be used for the layover of trains in the early 1900s. A vehicle repair and maintenance garage was located at 729 Davol Street, in the center of the site, from the early 1900s until the present. The Gemco machine shop and metal fabrication shop are currently located at 753 Davol Street. It is not known how long the shops have been operating at this location; however, the website for the company indicates it was founded in 1966, but did not state if Gemco has been operating a machine shop and metal fabrication shop at this location since that time. The historical use of the site constitutes multiple potential sources of OHM and is considered a REC with a medium potential impact due to the potential for releases to have occurred over the past 150 years of industrial use.

REC #4–Use of Site (729 Davol Street) as Vehicle Repair Garage—According to historic Sanborn fire insurance maps, the property located at 729 Davol Street was historically used as a vehicle repair garage since sometime prior to 1933. Jimmy's Tire Shop, which also performs vehicle maintenance and repair, currently operates at this property. Therefore, this property stores, uses, and/or generates petroleum and other OHM. The OHM would typically include waste oil, fuel oil, alcohol, anti-freeze, and degreasing chemicals which can contain chlorinated solvents. The improper use, storage, and/or generation of these products/wastes may have resulted in a release of OHM and is considered a REC with a medium potential impact.

REC #5–Use of Site (753 Davol Street and 175 Bayles Street) as Machine Shop and Metal Fabrication Shop—During a limited site reconnaissance on June 10, 2009, a sign on the office and warehouse building at 753 Davol Street indicated that the property was operated by "Baldor Industrial Electric Motors" and "Gemco Electrical and Mechanical Contractors." An internet search for "Gemco" at the 753 Davol Street address revealed that Gemco is "a leading electrical and mechanical contractor and employs services which include electrical power and controls, mechanical piping, machine work and rigging." The website stated that "Gemco has an 8,250-square-foot shop area that consists of a machine shop and metal fabrication shop." From an open door, soldering/welding and metal cutting/grinding

were observed to be occurring at the time of the site reconnaissance inside the brick warehouse building located at 753 Davol Street. An outside storage area consisting of various pipes and tubes was also observed near the warehouse building. Machine shops typically store and use various OHM in their processes and metal cutting involves the use of lubricating oils and other OHM. These processes may have resulted in a release of OHM and are considered a REC with a medium potential impact.

Potential Environmental Concerns—The Fall River Depot Station site has two potential environmental concerns.

Abandoned debris on the site, including a 55-gallon drum containing a small quantity of water at 825 Davol Street, broken television/computer monitors along the railroad platform, 40 to 50 containers of paint at 775 Davol Street, a large debris pile between Parcels O-15-0032 and O-155-0018, and an overgrown mound of unknown material, are of potential concern because the nature of the debris is unknown and it could contain contaminants that would release to the surrounding environment.

Given the age of the buildings located at the site, it is possible that hazardous materials, including roof flashing, tiles, and other materials, as well as lead-based paint, may be present in remaining building materials, surrounding debris piles, and soils.

Freetown Station Site

The Freetown Station site is located at 165 South Main Street in the Town of Freetown (Figure 4.12-4). The land consists of 14.2 acres, some of which is covered with buildings or paved surfaces that consist of indoor and outdoor storage facilities. Four rectangular storage buildings, along with a paved outdoor storage area, are located on the northeastern portion of the site. The paved outdoor storage area is used for boats, recreational vehicles, trucks, and storage trailers. A cellular phone signal tower and telecommunications facility are located on the site immediately south of the storage facilities. Approximately six large soil piles were observed on the site further south of the cellular phone signal tower. The western portion of the site is vegetated and unoccupied.

Based on the tasks conducted for the Freetown Station Phase I ESA, no RECs were identified for the site; however, three potential environmental concerns were identified and are described below.

Potential Environmental Concerns—The Freetown Station site has three potential environmental concerns:

- An outdoor storage area containing various boats, trucks, and other vehicles was observed during the site reconnaissance. Although the outdoor area was paved, there did not appear to be any engineered secondary containment to prevent a release of motor oil, gasoline, or antifreeze from migrating to environmental receptors. No staining or other indications of spills or release were observed.

- During the site reconnaissance, two pad-mounted electrical transformers were observed on the site. One of the transformers is located in a fenced-in area with the cellular phone signal tower. The second transformer is located outside the fenced-in area to the east of the cellular phone signal tower. A label indicated that this second transformer was owned by Commonwealth Electric Company. There were no stains or other indications of releases observed at the location of the transformers. It is not known if the transformers contain PCB

dielectric fluid. The transformers have the potential to leak transformer oil directly onto the ground.

- Given the age of the buildings located at the site, it is possible that hazardous materials, including roof flashing, tiles, and other materials, as well as lead-based paint, may be present in remaining building materials, surrounding debris piles, and soils.

King's Highway Station Site

The King's Highway Station site, located at 1024 King's Highway in New Bedford, consists of 13.4 acres (Figure 4.12-5). Active railroad tracks are located east of the property. The site is currently a commercial shopping plaza and historically was an industrial site.

Based on the tasks conducted for the King's Highway Station Phase I ESA, two RECs and three potential environmental concerns were identified and are described below.

REC #1–Historical Use of Site as Industrial Manufacturing—According to historical accounts of City of New Bedford personnel, the site and/or adjoining properties were used for industrial processes, including manufacturing ceramic lighting fixtures. These industrial processes likely used OHM, including machining oils, paints, coatings, and glazing. Based on the age of the industrial development and its past use, the potential presence of OHM is considered to be a REC with a medium potential impact.

REC #2–Gasoline Release at Adjoining Property (494 Church Street), Release Tracking Number (RTN) 4-15181—A gasoline release was identified at an adjoining property to the east at 494 Church Street. Information from a DEP file review indicated a release of approximately 1,000 gallons of gasoline had occurred. The DEP was notified of the release in December 1999. The release was issued RTN 4-15181, and a Class A-2 RAO was filed for the site in June 2004, indicating that a Permanent Solution had been achieved for the site; however, the contamination was not reduced to background. Although the anticipated groundwater flow direction is to the southeast, away from the site, the historic release of gasoline in close proximity indicates the possibility of impacts to the site and therefore is considered to be a REC with a low potential impact.

Potential Environmental Concerns—The King's Highway Station site has three potential environmental concerns including:

During the site reconnaissance, the outdoor storage of waste was identified in the rear of Savers retail store on the southern portion of the plaza. The solid waste in this area was observed to be stored in an uncovered and uncontained manner with generally poor housekeeping. Although OHM was not specifically identified, the general storage of waste materials in this manner indicates a potential for historical impacts related to spills and stormwater runoff of OHM.

During the site reconnaissance, two pad-mounted electrical transformers were observed on the eastern or rear portion of the site. One transformer appeared to be in good condition, while the other appeared to be in below average and was not mounted on an elevated pad. An additional pad-mounted electrical transformer was observed further south behind the plaza. There were no stains or other indications of releases observed at the location of the transformers. It is not known if the transformers contain (PCB dielectric fluid. The transformers have the potential to leak transformer oil directly onto the ground.

Based on the age of the buildings located at the site, asbestos-containing materials, including roof flashing, tiles, and other materials, as well as lead-based paint, may be present.

Whale's Tooth Station Site

The Whale's Tooth Station site is located at 532, 536 and 540 Acushnet Avenue, just east of Route 18 in the City of New Bedford (Figure 4.12-6). The land consists of 1.1 acres of paved surface currently used as a ferry terminal shuttle parking area. The surrounding area consists of commercial and light industrial properties. Active railroad tracks run along the eastern property boundary of the site.

Based on the tasks conducted for the Whale's Tooth Station Phase I ESA, three RECs and no potential environmental concerns were identified and are described below.

REC #1–Confirmed Contamination (RTN 4-118) and Historical Use of the Site as Freight Yard—Previous operations at the Conrail yard located at the site included offloading tank railroad cars containing PCBs. The following contaminants were detected in site soils: PCBs, arsenic, lead, and PAHs. The DEP was notified of the release in January 1987 and RTN 4-118 was assigned. The property was managed as a voluntary Brownfields site. The DEP and EPA concluded that it was technically infeasible to remediate the site. Contamination was limited to the fill portion of the site and was not detected in groundwater. Installation of an engineered barrier and implementation of deed restrictions consisting of Activity and Use Limitations (AULs) were sufficient to achieve a Permanent Solution, as defined by the MCP, at the site. Since contaminated soil was left in place beneath the paved surface, potential impacts related to exposures during future excavation or construction at the site exist. The potential impact of this REC is considered medium because exposure is limited due to the engineered barrier and the AUL.

REC #2–Acushnet Estuary (New Bedford Superfund Site)—The Acushnet Estuary, a water body located east of the site, was placed on the EPA's National Priorities List on September 8, 1983, and is referred to as the New Bedford Superfund site. The site contains PCB contamination that affects ambient air, surface water, groundwater, soil, sediment, and the food chain. Responsible parties have been identified; the contamination is the result of improper historic disposal of waste from two manufacturers which occurred over several decades, ending in the 1970s. The site was also reported to the DEP on January 15, 1987 at which time the release was issued RTN 4-122. The site is currently active. Although adequately regulated under state and federal regulations, the PCB contamination associated with this site has the potential to have impacted the subject site historically or potentially impact it in the future and is considered a REC with a medium potential impact.

REC #3–No. 2 Fuel Oil Release at Adjoining Property (618 Acushnet Avenue, RTN 4-14791)—A No. 2 fuel oil release was identified at the Department of Employment and Training, an adjoining property to the north with an address of 618 Acushnet Avenue. Information from a DEP file review indicated that a release of an unknown quantity of oil was reported on June 14, 1999. Approximately 19.3 tons of petroleum contaminated soil was removed from the site. A Class A-2 RAO was submitted to the DEP stating that a Permanent Solution was achieved; however, contamination was not reduced to background. Although the anticipated groundwater flow direction is cross gradient (to the east), the historic leaking fuel oil at the adjoining property is a potential threat of release to the site and is considered a REC with a low potential impact.

Taunton Depot Station Site

The Taunton Depot Station site is located west of the intersection of County Street and Taunton Depot Drive in Taunton (Figure 4.12-7). The site consists of a portion of three parcels totaling approximately 22 acres. The majority of the site is undeveloped. A sewer pumping system and generator associated with the retail stores to the southeast, surrounded by a chain link fence, extends approximately 200 feet west onto the site. An asphalt paved driveway leads up to this area. A truck and metal storage container are also located in that area. The southern portion of the site consists of a grassy field with little vegetation while the northern half of the site is densely wooded with walking paths. Land adjoining the railroad tracks to the west is wooded and consists primarily of wetland areas and small stream, which is a tributary of the Taunton River.

The Taunton Depot Station Phase I ESA did not identify any RECs. However, lead and arsenic based pesticides, herbicides, and/or synthetic fertilizers may previously have been applied to the Taunton Depot Station site when it was used as an orchard. These contaminants do not readily biodegrade and may be present in site soil at elevated concentrations.

Stoughton Alternative and Whittenton Alternative Station Sites

Easton Village Station

The Easton Village Station site is restricted to a portion of the railroad right-of-way that is owned by the MBTA in Easton, Massachusetts according to the Easton Assessor's Map No. 16U. The site is identified by the Easton tax assessor's database as Map and Parcel No. 20R-45 (Figure 4.12-8). Inactive railroad tracks are located in the center of the right-of-way, while overgrown vegetation occupies the majority of the remaining right-of-way. The site is approximately 50 feet in width and 600 feet in length, totaling approximately 30,000 square feet or 0.7 acres, and is located approximately 400 feet south of Oliver Street, 300 feet north of Main Street, and immediately west of Sullivan Avenue and Mechanic Street.

Based on the tasks conducted for the Easton Village Station Phase I ESA, two RECs and one potential environmental concern were identified and are described below.

REC #1–Fuel Oil Release at Adjoining Property (28 Main Street, RTN 4-19778)—Shovel Shop Square, the commercial buildings located on the site at 28 Main Street, was assigned RTN 4-19778 in May 2006 due to a release of petroleum hydrocarbons associated with former USTs. Elevated concentrations of lead and beryllium were also detected. Site remediation has included soil removal, off-site disposal, and dewatering.

Soil excavation occurred immediately west of the site, just north of Queset Brook. In 2006, a total of 42 soil samples collected from the walls and bottoms of the UST excavation areas showed EPH exceedances in 14 samples above the applicable soil standards. However, soil samples collected closest to the site showed no detections above laboratory reporting limits. Groundwater sampling performed in May and August 2007 found no contaminants in any samples at concentrations above the applicable standards, including the groundwater monitoring well located immediately adjacent to the site. Surface water samples from Queset Brook and Shovel Shop Pond collected in May 2007 showed no compounds were detected above the applicable guidelines or standards.

Although laboratory data for soil samples and groundwater closest to the site indicate no concentrations exceeding laboratory reporting limits for the COCs, the release is considered a REC with a low potential

impact because it abuts the subject site. Possible residual contaminants may still be present, and because groundwater flows from the disposal site toward the proposed Easton Village Station, the contaminants could be present on the site and not identified during assessment activities.

REC #2–Petroleum and Historic Fill Release at Nearby Property (64 Main Street, RTN 4-10839)—The Verizon Central Office Facility located at 64 Main Street, approximately 300 feet west of the site, was assigned RTN 4-10839 in October 1994 due to the presence of EPH compounds in soil. The Class A-2 RAO submitted for the property in December 2001 was reviewed. Remediation was conducted beginning in December 1994 and a total of 42 tons of contaminated soil was removed from the site. EPH compounds and PAHs were detected in soil and groundwater above the applicable standards during subsurface investigations which were conducted in 1995 through 1997 and 2000.

As part of a Phase IV Remedy Implementation Plan that was submitted to DEP in 2001, 27 tons of soil was excavated and 300 pounds of oxygen releasing compounds were injected into the base of the excavation area. Groundwater sampled in September 2001 showed no detections of EPH compounds or PAH target analytes above laboratory method detection limits. The source of the contamination is believed to be from a 1,000-gallon capacity No. 2 fuel oil UST and historic fill material.

The groundwater flow direction is shown to be to the northeast, toward the site. Based on this information, conditions present at this property could impact environmental media at the site and is considered a REC with a low potential impact.

Potential Environmental Concern—Easton Village Station has one potential environmental concern. A utility pole with three pole-mounted transformers was observed on the western boundary of the railroad right-of-way at the southern end of Shovel Shop Square. There were no stains or other indications of releases observed at the location of the transformers. It is not known if the transformers contain PCB dielectric fluid. The transformers have the potential to leak transformer oil directly onto the ground.

North Easton Station Site

The North Easton site is located west of the intersection of Roche Brothers Way and Washington Street/Route 138 in Easton and Stoughton, Massachusetts (Figure 4.12-9). The site consists of a portion of three parcels totaling approximately 5.2 acres. The site is currently void of buildings and primarily overgrown with grass or forest. A small wastewater treatment system and leaching field associated with the commercial development on Roche Brothers Way abuts the southern boundary of the site. The remainder of the southern portion of the site is covered with tall grass and serves as a drainage basin for the commercial property at 31 Roche Brothers Way. J F McNamara & Sons Construction Company currently uses the northern portion of the site to store dumpsters and roll-off containers.

Based on the tasks conducted for the North Easton Phase I ESA, no RECs were identified for the site; however, two potential environmental concerns were identified and are described below.

Potential Environmental Concerns—The North Easton Station site has two potential environmental concerns including:

During a site reconnaissance in 2002, it appeared that the southern portion of the site was used for target practice, based on ammunition shells and miscellaneous scrap metal with bullet holes that were observed scattered throughout that area. Ammunition shells and bullets typically contain high

concentrations of lead; therefore, elevated lead concentrations may be present in surficial soil in the area where target practice occurred. The frequency with which the property was used as target practice could not be determined. This activity would constitute a REC if it were determined that target practice occurred frequently at the property or the property was used as a commercial target shooting facility.

The presence of multiple storage containers on the northern portion of the site is of concern as the containers may be old and painted with lead-based paint. In addition, not every dumpster could be inspected for possible contents and the majority of the containers were rusting and in a state of disrepair.

Raynham Park Station Site

The Raynham Park Station site is located at 1958 Broadway in Raynham. The site parcel consists of a portion of the larger Raynham Dog Track Park and totals approximately 20 acres of land, with more than 80 percent of the property covered with buildings or paved surfaces, including dog kennel buildings, truck storage/maintenance buildings, storage containers, and parking lot space rented for the storage of wooden poles and snow removal equipment (Figure 4.12-10). The inactive rail right-of-way is located west of the property.

Based on the tasks conducted for the Raynham Park Station Phase I ESA, one REC and two potential environmental concerns were identified and are described below.

REC #1–Historic Use of the Site as Truck Maintenance and Industrial Storage—According to observations and reports of operations at the site, trucks, truck parts and equipment, telephone poles, track mats, and other materials have been stored at the site. The property manager for the site stated that the telephone poles are pressure treated and were not treated with creosote. No specific OHM storage was identified at the site during the site reconnaissance. The interiors of the buildings were not accessible during the site reconnaissance and the truck maintenance garage and related OHM storage were not inspected. These site operations could have potentially resulted in a release of OHM to the environment and therefore are considered a REC with a low potential impact.

Potential Environmental Concerns—The Raynham Park Station site has two potential environmental concerns. Two electrical transformers were observed to be located on the site. There were no stains or other indications of releases observed at the locations of the transformers. It is not known if the transformers contain PCB dielectric fluid. The transformers have the potential to leak transformer oil directly onto the ground. Given the age of the buildings located at the site, it is possible that hazardous materials, including roof flashing, tiles, and other materials, as well as lead-based paint, may be present in remaining building materials.

Taunton Station Site

The Taunton Station site is located north of the intersection of Arlington Street and William Hooke Lane in the City of Taunton (Figure 4.12-11). William Hooke Lane (previously referred to as Railroad Avenue) bisects the southern portion of the site in a north-south direction. Arlington Street borders the site to the southwest and the railroad tracks border the site to the east. The site consists of six parcels totaling 10.99 acres.

- Parcel 759–Except for an unoccupied building which is currently located in the southeastern portion of the site (on Parcel 759 with an address of 30 William Hook Lane) and abuts the

railroad tracks, the site does not contain of any building structures. A fire on the Parcel 759 property that occurred in March 2008 burned down the building located on the northern portion of the parcel. The concrete slab foundation and asphalt pavement are still present on the property.

- Parcel 761–This parcel is partially paved. A pile containing miscellaneous trash and debris is located in the southern portion of the parcel. A pile of railroad ties is also located on this parcel.
- Parcels 762, 763, and 764–The northern parcels are unpaved and partially wooded. A small pond and wetland area is located on Parcel 764.
- Parcel 760–Due to a series of fires and consequential demolition which have occurred on (100 Arlington Street) over a period of several years, there are no buildings remaining on the property. Remnants of a building complex, including the concrete slab foundations, are still present. A pond and stream are located in a wooded area on the central portion of the property. The southwestern portion of Parcel 760, which is unpaved, is currently used by contactors as a staging and storage area for the installation of an underground water main in the vicinity of the site. Several trucks, pipes, soil and gravel piles, and equipment are located there.

Based on the tasks conducted for the Taunton Station Phase I ESA, five RECs and four potential environmental concerns were identified and are described below.

REC #1–Historical Use of the Site—

- The Taunton Twist and Drill Company was located at the site west of William Hooke Lane on Parcel 760 beginning in the early 1900s. The New Jersey Rubber Company, a manufacturer of rubber soles and tubing, then occupied the site from the 1920s until the late 1970s. Both of these operations had the potential to release OHM used in manufacturing processes into the environment.
- A coal shed was located east of William Hooke Lane on Parcels 759 and 761 from the late 1800s until the mid-1900s, when Crown Tank Works, a manufacturer of steel tanks, operated on the property until the late 1990s. Coal residues may still be present in the surrounding soil from the loading and unloading of coal into trains.
- Underground fuel storage, manufacturing processes, and OHM storage may have released contaminants into the environment and is deemed a REC with a high potential impact.

REC #2–Conditions Associated with RTN 4-20854 at 100 Arlington Street—A two-hour reporting condition for a spill of five pounds of mercury was reported to the DEP in November 2007 and assigned RTN 4-20854. The release occurred during demolition activities when mercury beads were discovered under a pile of old meters in the bottom of a roll-off container. An Immediate Response Action (IRA) was approved during the initial notification for the excavation of up to 25 cubic yards of soil. No other documents were available for review at the DEP. The presence of OHM and detection of OHM in site media is deemed a REC with a medium potential impact.

REC #3–Conditions Associated with RTN 4-374 and the CERCLIS Listing at 100 Arlington Street—According to a CERCLIS report dated November 1994, improper handling and storage of hazardous substances were the sources of contamination at the property. Toluene was detected at 7,800 parts per million (ppm) and lead was detected at 1,300 ppm in samples collected from drums, bags, and sumps. EPA addressed additional asbestos and oil-contaminated waste debris, as well as transformers located outside the building. A removal action, which included only the wastes that presented an immediate threat to the public, was completed by contractors for EPA in January 1995. The DEP file for RTN 4-374 contained documents relating to the CERCLIS listing. The RTN has been assigned a Tier 1D, which indicates that site is in default because response actions have not been performed by the required deadlines.

The previously hired environmental consultant, who performed the asbestos removal for the 100 Arlington Street property, was interviewed on February 6, 2008. The environmental consultant stated that he reviewed the results of sampling activities previously conducted by EPA and that the soil and sediment collected from the on-site stream showed the presence of PAHs and metals impacts above regulatory criteria. The environmental consultant could not be certain if there were any regulatory exceedances in groundwater. The detection of OHM in site media and the out of compliance status indicating that this release is not being properly addressed are deemed a REC with a high potential impact.

REC #4–Conditions Associated with RTN 4-403 at 30 Railroad Avenue (William Hooke Lane)—According to a Phase I Initial Site Investigation Report prepared in 1995 by Quigley Environmental for Parcel 759, the property at the time consisted of a two-acre tank fabrication facility referred to as Crown Tank Works. Open areas on the property were used for parking and to store metal, liquid products consisting of naphtha and primer that were used for fabricating and finishing tanks. The report stated that an environmental assessment report prepared in 1987 indicated that contaminated soil was encountered during a tank removal operation and gasoline compounds were detected in one water sample. In addition, accidental kerosene spillage was reported by on-site personnel during routine handling practices. A RAM Plan to conduct response actions at the site was also prepared for the site and a RAM Completion Statement was submitted to the DEP in August 1996.

A Class A-3 RAO to permanently close out the site was prepared by Norfolk Environmental and submitted to the DEP in January 2002. A deed restriction, consisting of an AUL, was also implemented for the site.

The presence of multiple OHM sources, detection of OHM in site media, and an AUL is deemed a REC with a high potential impact.

REC #5–Transformer Found at 30 William Hooke Lane (Parcel 759)—During the site reconnaissance visit on November 17, 2008, a fallen pole-mounted transformer on an unpaved surface was observed near the foundations of the demolished building at 30 William Hooke Lane. The transformer was once located on a utility pole that was damaged by fire. The transformer appeared to be an older model, which is typically associated with PCB-containing oils.

The potential presence of an OHM source and detection of OHM in site media is deemed a REC with a medium potential impact.

Potential Environmental Concerns—The Taunton Station site has four potential environmental concerns:

- Given the age of the former buildings which were previously located at the site, it is possible that asbestos-containing materials may be present in the floor tiles currently remaining at the site.

- Given the age of the current building remaining at the site, it is possible that hazardous materials, including roof flashing, tiles, and other materials, as well as lead-based paint, may be present in remaining building materials, surrounding debris piles, and soils.

- Three pole-mounted transformers were observed on a utility pole on the eastern side of William Hooke Lane. There were no stains or other indications of releases observed at the locations of the transformers. It is not known if the transformers contain PCB dielectric fluid. The transformers have the potential to leak transformer oil directly onto the ground.

- A pile containing miscellaneous debris including lumber, old buckets, tires, and plastic tarps was observed in the southern portion of Parcel 761. The asphalt pavement was weathered and cracking. A large pile of railroad ties was also observed in the area along the existing railroad tracks. The parcel was once used to store trucks, and there were also small pieces of automobile parts scattered across the property. The general storage of debris materials in this manner indicates historically poor housekeeping practices and a potential for impacts to environmental media. In addition, railroad ties specifically contain certain OHM.

Dana Street Station

The proposed Dana Street Station site is adjacent to the active Attleboro Secondary rail line and includes on-site and nearby historic and current industrial uses (Figure 4.12-12). A literature review of MassDEP records and Sanborn Fire Insurance maps identified the following environmental concerns for the site; a full report is provided in Appendix 4.12-A, with figures showing the area. The report provides the following observations:

- The proposed station site is partially occupied by an active state-listed disposal site. The disposal site may be out-of-compliance with the applicable regulations and the lack of documentation suggests that remedial actions have not been conducted to mitigate soil contamination that has been identified on site, including petroleum constituents and metals.

- The site and abutting property to the south has a long history of industrial use: the property at 28 Dana Street, for example, is currently used as a scrap yard. The extent to which these industrial activities have impacted the site is unknown.

- A portion of the site west of Dana Street was formerly occupied by a railroad yard since at least 1888. Contaminants associated with former railroad operations include metals and semi-volatile organic compounds. Urban fill, which can contain metals and polycyclic aromatic hydrocarbons, may have also been placed on the site in order to fill in wetland areas. A vegetation control program may have been implemented in the railroad right-of-way and may have introduced lead, arsenic, and other pesticide/herbicide-related contaminants into soils.

The site environmental media have the potential to be impacted by numerous sources related to industrial and, potentially, agricultural uses. Contamination associated with the disposal site has been documented.

Prior to construction, it is recommended that a plan be developed to properly handle and manage soil and groundwater that may be contaminated, which would likely incorporate pre-characterization of media requiring management. Soils should be handled in a manner that protects the health and safety of workers, nearby receptors, and visitors to the site. In addition, impacted soil and groundwater should be managed in accordance with applicable regulations and policies prior to leaving the site, should export be required.

Relocated Stoughton Station

The Stoughton Station is proposed to be located north of Brock Street, south of Morton Street and west of the rail alignment. A Phase I ESA was conducted for the parcels that would be acquired in whole or in part for the station and the realignment of the tracks in the vicinity of the station. The assessment was conducted to identify, to the extent feasible, RECs in connection with the property. The Phase I ESA is attached in Appendix 4.12-B.

Nine properties with RECs were identified during the Phase I ESA. Four of these parcels are property on which the station would be located, while the other five parcels are off-site but nearby. Two of the on-site parcels comprise the main portion of the proposed site and would be acquired in whole. Only small portions of the other two on-site parcels would be needed for the station. Final design of the station may eliminate these two taking requirements, resulting in these RECs being re-categorized as occurring on off-site parcels (Figure 4.12-13).

The Phase I ESA determined that four of the parcels comprising the site (two at 25 Brock Street, and one each at Morton Square and Morton Street) have a moderate potential to contain soil and groundwater contaminants due to prior or current industrial activities. The two properties which may be partially acquired have a high potential of containing petroleum-contaminated soils or groundwater. Reported releases and industrial uses on adjacent properties also constitute a low to moderate potential to affect the site. The nine RECs are discussed below.

REC #1–2 Canton Street, Former Use of Property and On-Site Disposal Site (RTNs 4-21470, 4-875, and 4-18753)—A disposal site located at 2 Canton Street was assigned RTN 4-875 for a release of petroleum discovered during the removal of two underground storage tanks (USTs) in 1989. A second disposal site was assigned RTN 4-21470 for petroleum contamination discovered during the removal of an additional UST. A third disposal site was assigned RTN 4-18753 in October 2004 for the detection of separate phase product in two piezometers. The presence of contamination is associated with the industrial uses of the property, which have included operation by the Mystic Rubber clothing company, Stoughton Rubber Company, and Joseph F. Corcoran Shoe Company. A Class A-3 Response Action Outcome (RAO) was achieved for all three disposal sites in October 2009, which indicates that contaminant concentrations were not reduced to background, and a Condition of No Significant Risk is dependent upon the implementation of an activity and use limitation (AUL) on the property. The former petroleum storage, industrial uses, and existing contamination on the Site are deemed a REC with a high potential impact.

REC #2–Off 17 Morton Square, Murphy Coal Company, On-Site Automotive Repair, Petroleum Storage, and Disposal Site (RTN 4-13478)—An on-site disposal site on the property off Morton Square owned by Murphy Oil Company was assigned RTN 4-13478 in November 1997 when a representative

from MassDEP identified an oil-stained area and improperly stored waste oil at the property. The disposal site achieved a Class A-1 RAO in May 1998, which indicates that a Condition of No Significant Risk was achieved and contaminant levels were reduced to background.

According to Sanborn maps, the property has been occupied by Murphy Coal Company since at least 1923, and formerly contained a coal shed and scales. The company is currently permitted for three 15,000-gallon and two 10,000-gallon above ground storage tanks (ASTs) associated with the sale and distribution of fuel oil. The ASTs have been present since at least 1957 according to historic aerial photographs and the current condition of the tanks is unknown. The assessor's card also indicates that the property is used as an automotive repair garage. Former repair operations at the property may have required the use of OHM including petroleum products, solvents, and other OHM. These OHM have the potential to contaminate environmental media when not handled or disposed of properly. In addition, during the Site reconnaissance, several piles of fill (gravel, sand, stumps), and pieces of heavy machinery were also observed on the property. The origin of the fill material is unknown, and machinery can leak petroleum or fluids to the environment when not properly maintained. These industrial uses of the property and record of environmental contamination are deemed a REC with a medium potential impact.

REC #3–25 Brock Street, Former Use of the Property and On-Site Disposal Site (RTN 4-13476)—The two site parcels with an address of 25 Brock Street have an extensive history of industrial uses, including operation by the Meade Rubber Company in the early 1900s, L. Albert & Son rubber machinery in the mid-1900s, and a latex and shoe materials manufacturer around 1966. According to recent environmental reports, the property has also been used as a machine shop. According to the Fire Department, five petroleum ASTs have been removed from the Site. No information was available regarding the condition of the tanks or analytical testing of the surrounding environmental media. Furthermore, a complaint was filed by the Fire Department in 1979 noting an oil storage violation at the property. According to the assessor's cards, two of the Site buildings are currently heated with oil.

In addition, a disposal site located at 25R Brock Street was assigned RTN 4-13476 in November 1997 for a release of approximately 15 gallons of No. 2 fuel oil. The release occurred when a 275-gallon AST tipped over and began leaking from a pipe. The disposal achieved a Class A-1 Response Action Outcome (RAO) in August 1999, which indicates that contaminant concentrations were reduced to background and a Condition of No Significant Risk was achieved. The industrial uses of the property, former petroleum storage, and presence of an on-Site disposal site are deemed a REC with a medium potential impact.

REC #4–48 Wyman Street, Former Use of the Property as a Machine Shop—The property at 48 Wyman Street comprises a portion of the Site, and was formerly used for the sale of automotive parts, and as a machine shop. Former repair operations at the property may have required the use of OHM including petroleum products, solvents, and other chemicals. These OHM have the potential to contaminate environmental media when not handled or disposed of properly. In addition, the property is noted by the assessor's to be heated with oil and the condition of any storage tanks at the property is unknown. No access was granted in order to observe the interior of the building located on the Site and it has been conservatively assumed that a REC with a low potential impact is present associated with former site use including a machine shop and petroleum storage.

REC #5–931 Washington Street, Current Auto Repair and Former Filling Station (Off-Site)—The property located at 931 Washington Street was formerly the location of a gasoline station as depicted in

the 1966 Sanborn map. An associated 3,000-gallon gasoline UST, which was installed in March 1947, has been removed from the property according to the MassDEP UST Query database. No information was available regarding the condition of the tank or analytical testing of the surrounding environmental media. The property has also been permitted as a Conditionally Exempt Small Quantity Generator (CESQG) since 1986 and is currently used for automotive repair. Manifests have been used to transport ignitable hazardous waste, such as petroleum distillates, from the property since this time. These chemicals have the potential to contaminate environmental media when not handled or disposed of properly. The property is located approximately 50 feet east of the site. The former use of the property as a gasoline station and current use for automotive repair in close proximity to the site are deemed a REC with a medium potential impact.

REC #6–24-46 Morton Street, Chemical Company (RTN 4-11611, Off-Site)—Alpha Chemical Company located at 24-46 Morton Street abuts the Site to the west. The company has been listed as a RCRA CESQG since 2004, and wastes transported from the property under manifest include lead, 1,1,1-trichloroethane, hydrofluoric acid, and dimethyl-benzene. The company manufactures acid sanitizer, disinfectants, mildew preventatives, and liquid chlorinating products. Large aboveground tanks were noted against the western exterior of the company's building during the Site reconnaissance. In addition, a 1,000-gallon fuel oil tank was removed from the property in 1993 and there was no information provided by the Fire Department regarding analytical testing or environmental observations. Chemicals and petroleum stored at the property have the potential to have been released to the environment due to improper handling, disposal, or maintenance of containment structures. The storage of chemicals and petroleum at the property are therefore deemed a REC with a medium potential impact.

REC #7–945 Washington Street, Active Drycleaning Business (Off-Site)—Pearl Drycleaners of 945 Washington Street is listed with the MassDEP as a regulated drycleaning facility. This status indicates that the business utilizes perchloroethylene (PCE), a chemical solvent. When not properly disposed, PCE can contaminate soil and is highly mobile in groundwater. The property is located less than 100 feet southeast of the Site. The chemical handling practices of the drycleaning business are unknown and there is currently no publically available testing data for soil or groundwater between the Site and property. Therefore, the use of chemical solvents at the property is a deemed a REC with a low potential impact.

REC #8–45 Wyman Street, Former Petroleum Storage at Stoughton Train Station (Off-Site)—The historic Stoughton train station constructed in 1888 and located at 45 Wyman Street was formerly heated using three 330-gallon above ground storage tanks located in the building's basement. According to the Stoughton Fire Department, the tanks were removed in 1997; however, no information was provided regarding the condition of the tanks or the surrounding basement floor. There is a potential for petroleum to have been released to the surrounding environment during fuel deliveries, or if the tanks and piping were improperly maintained. The station is located less than 50 feet northeast of the Site. Therefore, the former petroleum storage in close proximity to the Site is deemed a REC with a low potential impact.

REC #9–825 Washington Street, Nearby Disposal Sites and Former Filling Station, (RTNs 4-12937, 4-11868, 4-13560, and 4-13682)—Four releases have been identified at the former gasoline station located at 825 Washington Street. The primary contaminants are petroleum constituents, which are currently undergoing remediation. A definite groundwater flow direction has not been established at this property, which is located approximately 150 feet east of the site. In addition, only one monitoring

well exists between the disposal site and site, which has been frequently dry and therefore may have not been installed at a sufficient depth to detect contamination. Due to this lack of information and the presence of a plume of petroleum constituents in groundwater, the disposal sites at this property are deemed a REC with a medium potential impact.

Additionally, three potential environmental concerns or *de minimis* conditions have been identified for the site:

Based on the age of the on-site buildings that may be demolished for the relocated Stoughton Station, asbestos containing materials, including roof flashing, tiles, and other materials, as well as lead based paint, may be present.

Due to the site's location within a densely developed area, close proximity to a railroad right-of-way and a long history of industrial and commercial use, urban fill may have been used to fill portions of the site. Urban fill can contain metals and polycyclic aromatic hydrocarbons (PAHs) originating from coal/wood ash, tar, and/or slag.

Due to the close proximity of the railroad tracks and likely implementation of a vegetation control program in the vicinity of the railroad tracks, there is a possibility that lead, arsenic, and other contaminants from pesticides are present in site soil.

4.12.2.3 Layover Facility Sites

New Bedford Main Line Layover Site

Wamsutta Layover Site

The Wamsutta layover site is located on a triangular shaped property in a commercial and light industrial area of New Bedford (Figure 4.12-14). The site is located south of Wamsutta Street, east of the railroad tracks, and west of Herman Melville Boulevard and is approximately 12 acres in size. Due to immobile soil contamination, the site was capped with a geotextile membrane in approximately 2004. Two grassy mounds are located on the eastern portion of the site. Railroad tracks abut the site to the west and travel off site to the north. Railroad tracks also extend from the northeastern site boundaries to the harbor, which is located approximately 100 feet to the east. The trains haul dredged sludge from the harbor to the east and travel to the site for off-site disposal.

Based upon the tasks conducted for this Phase I ESA, five RECs and three potential environmental concerns associated with the site were identified and are described below.

REC #1–Historic Use of Site as Freight Yard and Placement of Permanent Engineered Barrier Above Impacted Soil at Site, RTN 4-118—The former Conrail Yard comprising the site was managed as a voluntary Brownfield site. RTN 4-118 was initially assigned to this site and the nearby Whale's Tooth property located south of the site by the DEP in January 1987. The center of the site contained elevated concentrations of PCBs, arsenic, lead, and PAHs with the perimeter having lower concentrations of these contaminants in soil. An agreement was reached with the DEP and EPA based on the financial infeasibility of remediation at the site. The contamination was proposed to be left in place with proper engineering controls, such as a soil geotextile composition cap and land use restrictions consisting of an AUL in the areas exhibiting the highest concentrations of contamination above the Upper Concentration Limits. Since contaminated soil was left in place, there are potential impacts related to exposure during

future soil disturbance at the site during construction related to the South Coast Rail project. Therefore, this condition is considered a REC. The potential impact of this REC is considered medium because exposure is limited due to the engineered barrier and the existence of an AUL.

REC #2–Documented Release at Acushnet Estuary (New Bedford Superfund Site), RTN 4-122—The Acushnet Estuary, a water body located to the east of the site, was placed on the National Priorities List and became a Superfund site in 1983. This site contains PCB contamination that affects ambient air, surface water, groundwater, soils, sediment, and the food chain. The contamination is the result of improper historic disposal of wastes which occurred over several decades up until the 1970s. The site is currently active and was assigned RTN 4-122 by the DEP in 1987. Although adequately regulated under State and Federal regulations, the PCB contamination associated with this site is widespread and has the potential to have impacted the subject site historically or potentially impact it in the future through continued contaminant migration and is considered a REC with a medium potential impact.

REC #3–Documented Fuel Oil Release at Adjoining Property (618 Acushnet Avenue), RTN 4-14791—A No. 2 fuel oil UST release from a western adjoining property, the Department of Employment and Training, located at 618 Acushnet Avenue, was identified in June 1999. A total of 20 tons of petroleum contaminated soil was removed from the property. A Class A-2 RAO, indicating that a Permanent Solution was achieved but that contamination was not reduced to background, was submitted to the DEP. The anticipated direction of groundwater flow is to the east toward the property comprising the site. However, given the quantity and regulatory status, this REC is deemed to have a low potential to affect site media.

REC #4–Documented Diesel Fuel Release and AUL at Nearby Property (1 Wamsutta Street), RTN 4-11715—A diesel fuel UST release from a property located northeast of the site to soil was reported to the DEP in October 1995. Approximately 100 cubic yards of petroleum impacted soil was removed. Exceedances of 2-methylnaphthalene in soil were detected above the applicable regulatory standards and a deed restriction consisting of an AUL was placed on the property along with a Class A-3 RAO in October 1996. Although groundwater was not impacted, the groundwater flow direction was determined to flow to the south-southwest toward the site. Based on the proximity of the site, the direction of groundwater flow, and the implementation of an AUL indicating residual petroleum impacts are present, this REC is deemed to have a low potential to affect site media.

REC #5–Documented PCB Release at Nearby Property (New Bedford Main Interceptor), RTN 4-127—PCBs were detected during the filling of an abandoned interceptor pipe with grout in soil in an area located northeast of the site. Limited documents were available for review on this release at the DEP file review. Available documents stated that an AUL will be necessary to achieve a condition of No Significant Risk for the property indicating residual soil impacts are present. Based on the proximity of this property to the site and the lack of information available for review, this property may have the potential to impact the site and is deemed a REC with low potential to impact the site.

Potential Environmental Concerns—The Wamsutta layover site has three potential environmental concerns:

- An electrical substation containing transformers abuts the site to the west off Acushnet Avenue. It is not known if the transformers contain PCB transformer oil. The transformers have the potential to release transformer oil directly onto the ground surface.

- A motor repair facility abuts the site to the east off Herman Melville Boulevard. Numerous 55-gallon drums were observed outside behind the facility facing the site and most likely contained OHM. The drums were not placed on pallets or any other type of secondary containment structure. Releases or spills from the drums, should they occur, have the potential to impact the site.

- Numerous piles of unused new creosote coated railroad ties were located in two areas in the northern portion of the site. Creosote contains heavy organic compounds that have the potential to leach into soil and groundwater.

Weaver's Cove East Layover Site

The Weaver's Cove East Layover site consists of three parcels and is situated between the railroad tracks, which are located to the west, and North Main Street, which is located to the east, in a mixed use area of Fall River (Figure 4.12-15). The former Shell Oil Company petroleum product distribution facility is located southwest of the railroad tracks. The Weaver's Cove portion of the Taunton River is located immediately west and northwest of the railroad tracks. The parcels comprising the site are currently undeveloped and surrounded by a chain-link fence. Groundwater monitoring wells were observed throughout the site.

The southernmost parcel (Parcel T-1-38) consists of a concrete slab from a former repair garage that was used by the New England Telephone & Telegraph company. The land around the slab consists of grass, shrubs and trees. The center parcel (Parcel T-1-33) consists of a heavily vegetated wetland area that reportedly was formed from a depression caused by the weight of a former gasoline AST. The northernmost parcel (Parcel T-15-1) is vegetated and primarily covered with shrubs and trees.

Based on the tasks conducted for the Weaver's Cove East Layover site Phase I ESA, five RECs and one potential environmental concern were identified and are described below.

REC #1–Previous Use of Site as Oil Storage Facility and Documented Petroleum Release at Site, RTN 4-749—According to historic Sanborn maps, from the early to mid-1900s, a large gasoline AST was located on the center portion of the site. Numerous ASTs of various sizes were also located west of the site across the railroad tracks. The portion of the site that contained the AST was listed as owned by Shell Oil Company (Shell). The AST located at the site was removed in the mid-1900s. According to documents reviewed, Shell operated a crude oil refinery, product storage and distribution facility at the western abutting property from 1920 to 1929 and a petroleum product distribution facility from 1929 to 1995.

Documents obtained from the Fall River Fire Department include a letter from the DEP to Shell Oil Company at One New Street dated February 9, 1993. The letter refers to the Notices of Responsibility dated 1989 and 1992 relative to releases of petroleum products on their property and requests "Short Term Measure Activities" to address the oil release. A map prepared by Handex dated November 4, 1992 depicts a large area of petroleum impacts, which includes the site and the abutting property located west of the site, as well as the former and current tank locations. Contours on the map show the thickness of the LNAPL in groundwater of thickness up to 2.5 feet. In the center of the site, the LNAPL thickness is shown to be 2 feet.

The previous use of the site as an oil storage facility and the documented extensive petroleum release constitutes a REC with a high potential impact.

REC #2–Previous Use of Adjoining Property as Petroleum Product Distribution Facility and Documented Release (Shell Oil Company, 1 New Street), RTN 4-749—As stated in REC #1 above, Shell operated a crude oil refinery, product storage and distribution facility at the western abutting property from 1920 to 1929 and a petroleum product distribution facility from 1929 to 1995. According to documents reviewed, extensive petroleum releases occurred on that property during that time. According to a recent ROS Status Report dated November 2008, this property is currently being remediated with a LNAPL recovery and groundwater treatment system. Even though active remediation activities are currently ongoing and groundwater flows to the northwest toward the Taunton River and away from the site, the presence of extensive LNAPL in the subsurface is deemed a REC with a high potential impact.

REC #3–Previous Use of Building on Parcel T-1-38 as a Commercial Garage—Recent aerial photographs of the southern portion site located on Parcel T-1-38 show the presence of a concrete slab, indicating that a building was once present. A Sanborn map dated 1976 shows the existence of a "private garage" that was operated by New England Telephone and Telegraph Company.

It is assumed that vehicle repairs were performed in this building and that petroleum and other OHM were stored, used, and generated. The petroleum and OHM would typically consist of motor oil, waste oil, fuel oil, alcohol, anti-freeze, and degreasing chemicals that may contain chlorinated solvents. The storage, use, and/or generation of these products may have or could result in a release of OHM constituting a REC with a medium potential impact.

REC #4–Existence of USTs on Parcel T-1-38—According to records received from the Fall River Fire Prevention Department, three USTs were previously located on Parcel T-1-38, which is described above in REC #3, with an address of 2680 North Main Street. The USTs included a 4,000-gallon gasoline tank, a 275 waste oil tank, and a 6,000-gallon No. 6 fuel oil tank. The records document the removal of the gasoline and waste oil tanks which were removed in 1988 and 1987, respectively. There are no records documenting the removal of the No. 6 fuel oil tank.

It was not indicated on the removal records if contamination was encountered during the removal of the gasoline and waste oil tanks and detailed closure reports were not identified. Therefore, OHM may be present in the locations of the former USTs. In addition, it is possible that the No. 6 fuel oil UST, the integrity of which is unknown, may still be present. OHM associated with the USTs formerly/currently on this property would constitute a REC with a medium potential impact.

REC #5–Possible Presence of Elevated Concentrations of Metals in Soil at Adjoining Property (1 New Street)—According to a report reviewed for a western adjoining property, arsenic and beryllium were detected in soil above applicable standards at a depth beginning from the ground surface to a depth of approximately eight feet below grade. The detection of these metals are believed to be attributable to historic filling activities in the 1920s during which fill material was dredged from the Taunton River. According to historic Sanborn maps, the area located to the west of the site was previously under water and was filled in the early 1900s. The Sanborn map also shows a portion of the site to be previously under water; which appears to have been filled in the early 1900s. Therefore, arsenic and beryllium-impacted soil may be present in site soils. Coal ash was found to be present in the fill on the adjacent property; therefore, the presence of metals may be consistent with the MCP's definition of background, and no response actions under the MCP may be necessary. However, aside from the regulatory provisions, the potential presence of OHM at levels which could pose a risk to human or ecological

populations is considered a REC with a low potential impact and would need to be managed appropriately during any proposed construction activities.

Potential Environmental Concern—Weaver's Cove East Layover site has one potential environmental concern. During the site reconnaissance, pole-mounted electrical transformers were observed on the site. It is not known if these transformers contain PCB transformer oil. The transformers have the potential to leak transformer oil directly onto the ground surface.

4.12.2.4 Summary

Phase I ESAs or environmental screenings were conducted for the station sites, layover facility sites and rail corridors associated with the alternatives under consideration. The Phase I ESAs indicate that multiple proposed station and layover locations either border or are the location of known and/or suspected OHM contamination and may also contain building materials that can include asbestos, lead, and other OHM. These conditions represent the potential to encounter OHM impacts when demolishing buildings or constructing new stations and rails, including soil excavation and groundwater management. A table summarizing the RECs and potential environmental concerns for each station site is provided in Table 4.12-1.

Based on the findings of the Phase I ESAs, further evaluation for subsurface contamination may be needed for proposed station, layover, and rail locations with RECs classified as having a high or medium potential to impact each site and which may be subject to disturbance during implementation of the South Coast Rail project prior to acquisition and/or construction. The results of the subsurface investigations previously conducted for Whale's Tooth Station and Wamsutta Layover show that OHM is currently present above regulatory standards below an engineered barrier; these properties, therefore, do not have to be reassessed. Based on updated information regarding Battleship Cove Station and King's Highway Station, no property acquisition or station construction would occur; therefore, no further investigations are recommended for these stations. Further investigation prior to construction is recommended at these sites:

- Stoughton Station
- Fall River Depot
- Raynham Park
- Taunton Depot Station
- Weaver's Cove East
- Dana Street Station
- Whittenton Branch
- Taunton Station
- Freetown Station
- Easton Village

Table 4.12-1 Summary of RECs by Location

Location	REC No.	Ranking	Address	RTN	Impact
King's Highway	1	Medium	Site (1024 King's Hwy)	Not applicable	Historical use
King's Highway	2	Low	Adjoining property (494 Church Street)	4-15181	Gasoline release
Whale's Tooth	1	Medium	Site (532, 536 & 540 Acushnet Avenue)	4-118	Confirmed contamination (PAHs, PCBs, arsenic lead) and capping
Whale's Tooth	2	Medium	Nearby property (Acushnet Estuary)	4-122	PCB release
Whale's Tooth	3	Low	Adjoining property (618 Acushnet Avenue)	4-14791	No. 2 fuel oil release
Fall River Depot*	1	High	Site (390, 775 & 825 Davol St. & 61 Pearce St.)	Not applicable	Confirmed contamination (VPH, EPH, PAHs)
Fall River Depot*	2	High	Site (see above)	Not applicable	Presence of USTs
Fall River Depot*	3	High	Site	Not applicable	Historic use
Fall River Depot*	4	Medium	Site (729 Davol Street)	Not applicable	Historic and current use as vehicle repair garage
Fall River Depot*	5	Medium	Site (753 Davol Street and 175 Bayles Street)	Not applicable	Use as machine shop and metal fabrication shop
Battleship Cove	1	Medium	Adjoining properties	Not applicable	Historic use
Battleship Cove	2	High	Site (24 Ponta Delgata Boulevard)	Not applicable	Confirmed contamination (PAHs and lead)
Easton Village	1	Low	Adjoining property (28 Main St)	4-19778	Fuel oil release
Easton Village	2	Low	Adjoining property (64 Main St)	4-10839	Petroleum and historic fill release
Raynham Park*	1	Low	Site (1958 Broadway)	Not applicable	Historic use
Taunton*	1	High	Site (100 Arlington Street & 30 William Hooke Lane)	Not applicable	Historic use
Taunton*	2	Medium	Site (100 Arlington St.)	4-20854	Mercury release
Taunton*	3	High	Site (100 Arlington St.)	4-374	Metals and petroleum release
Taunton*	4	High	Site (30 William Hooke Lane)	4-403	Gasoline and kerosene release
Taunton*	5	Medium	Site (30 William Hooke Lane)	Not applicable	Possible electrical transformer release

Location	REC No.	Ranking	Address	RTN	Impact
Stoughton Station*	1	High	2 Canton Street	4-875, 4-18753, 4-21470	Former Industrial Property and On-Site Disposal Site
Stoughton Station*	2	Medium	Off 17 Morton Square	4-13478	Murphy Coal Company On-Site Automotive Repair, Petroleum Storage, and Disposal Site
Stoughton Station*	3	Medium	25 Brock Street	4-13476	Industrial and Commercial Use and On-Site Disposal Site
Stoughton Station*	4	Low	48 Wyman Street	Not Applicable	Machine Shop
Stoughton Station	5	Medium	931 Washington Street	Not Applicable	Current Auto Repair and Former Filling Station
Stoughton Station*	6	Medium	24-46 Morton Street	RTN 4-111611	Chemical Company
Stoughton Station	7	Low	945 Washington Street	Not Applicable	Active Drycleaning Business
Stoughton Station	8	Low	45 Wyman Street	Not Applicable	Stoughton Train Station
Stoughton Station*	9	Medium	825 Washington Street	4-12937, 4-11868, 4-13560, 4-13682	Nearby Disposal Sites and Former Filling Station
Dana Street Station*	1	High	140 Dana Street	4-11341	Active State-Listed Disposal Site
Dana Street Station*	2	Medium	28 Dana Street and Site	Not Applicable	Scrap Yard
Dana Street Station*	3	Low	60 Hodges Street	Not Applicable	Pesticides, Herbicides
Dana Street Station*	4	Medium	West of Dana Street	Not Applicable	Former Rail Yard
Wamsutta Layover	1	Medium	Site	4-118	PCBs, arsenic, lead, and PAHs
Wamsutta Layover	2	Medium	Nearby Property (Acushnet Estuary)	4-122	PCB release
Wamsutta Layover	3	Low	Adjoining Property (618 Acushnet Avenue)	4-14791	No. 2 fuel oil from UST
Wamsutta Layover	4	Low	Nearby Property (1 Wamsutta Street)	4-11715	Diesel fuel from UST
Wamsutta Layover	5	Low	Nearby Property (New Bedford Main Interceptor)	4-127	PCBs
Weaver’s Cove East Layover*	1	High	Site	4-749	Previous use as oil storage facility and documented release
Weaver’s Cove	2	High	Adjoining property	4-749	Previous use as

Location	REC No.	Ranking	Address	RTN	Impact
East Layover*			(Shell Oil Co., 1 New Street)		petroleum products distribution facility and documented release
Weaver's Cove East Layover*	3	Medium	Site (Parcel T-1-38)	Not applicable	Previous use as commercial garage
Weaver's Cove East Layover*	4	Medium	Site (Parcel T-1-38)	Not applicable	Existence of USTs
Weaver's Cove East Layover	5	Low	Adjoining Property (1 New Street)	Applicable	Detection of arsenic and beryllium in soil
Whittenton Branch*	1	Medium	Adjoining property (437 Whittenton Ave.)	4-18532	Transformer oil releases
Whittenton Branch*	2	Medium	Adjoining property (437 Whittenton Ave.)	Not applicable	Historic use
Whittenton Branch*	3	Medium	Adjoining property (Segment 1)	Not applicable	Historic dumping in wetland
Whittenton Branch*	4	High	Adjoining property (728 Broadway, Raynham)	4-16976	Kerosene release and use of property

* Further investigation is recommended at these sites

The purpose of the subsurface investigations would be to screen each site for the presence of OHM that could impact construction and/or operation of the stations. In areas determined to be impacted by a release of OHM, soil and groundwater information will be useful in developing a management plan for impacted media and defining worker protection requirements and required response actions (if any) under the MCP.

4.12.3 Analysis of Impacts

4.12.3.1 Southern Triangle (Common to All Rail Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all rail alternatives. These rail lines form a rough triangular shape running south from Myricks Junction to Fall River (the Fall River Secondary) and from Weir Junction through Myricks Junction to New Bedford (the New Bedford Main Line), and are therefore referred to as the Southern Triangle.

The Southern Triangle includes six stations, which include a total of 12 identified RECs. Three of the RECs were evaluated as having a "high" impact, seven RECs were evaluated with "medium" impacts and two RECs were evaluated as having "low" impacts. Table 4.12-2 lists each of the RECs for the stations along the Southern Triangle. Stations located on the Southern Triangle include Battleship Cove, Taunton Depot, Fall River Depot, Freetown, King's Highway and Whale's Tooth. A total of eight structures would be demolished for station construction.

In summary, there is a substantial likelihood that contamination would be encountered and would need to be addressed at Battleship Cove and Fall River Depot stations. There is a moderate likelihood that contamination would be encountered and need to be addressed at King's Highway Station. An engineered barrier was constructed at the Whale's Tooth site and contaminated soil was left in place beneath the barrier. There are potential impacts related to exposure during the future excavation or

construction at this proposed station. It is less likely that contamination would be encountered at the Taunton Depot and Freetown stations.

Table 4.12-2 RECs—Southern Triangle

Station	Number of Structures to be Demolished	REC Description	RTN	Relative Impact
Battleship Cove	0	Analytical Results from Previous Subsurface Investigation	Not applicable	High
		Historical Use of the Adjoining Properties	Not applicable	Medium
Taunton Depot	0	None	Not applicable	Not applicable
Fall River Depot	8	Analytical Results from Previous Subsurface Investigations	Not applicable	High
		Previous and Current Existence of USTs	Not applicable	High
		Historic Use of Site Properties	Not applicable	Medium
		Use of Site (729 Davol Street) as Vehicle Repair Garage	Not applicable	Medium
		Use of Site (753 Davol Street) as Machine Shop and Metal Fabrication Shop	Not applicable	Medium
Freetown	0	None	Not applicable	Not applicable
King's Highway	0	Historic Use of Site as Industrial Manufacturing	Not applicable	Medium
		Gasoline Release at Adjoining Property (494 Church St.)	4-15181	Low
Whale's Tooth	0 (has small attendant's booth and storage shed)	Confirmed Contamination and Historical Use of Property as Freight Yard	4-118	Medium
		Acushnet Estuary (New Bedford Superfund Site)	4-122	Medium
		No. 2 Fuel Oil Release at Adjoining Property (618 Acushnet Avenue)	4-14791	Low

4.12.3.2 Stoughton Alternatives

The Stoughton Alternatives would provide electric or diesel commuter rail service to South Station using the Northeast Corridor, Stoughton Line, New Bedford Main Line, and Fall River Secondary. Both electric (Stoughton Electric) and diesel (Stoughton Diesel) commuter rail options were evaluated for this alternative. The New Bedford route would be 54.9 miles long and the Fall River route would be 52.4 miles long.

This alternative requires improvements to track infrastructure along the Stoughton Line. This alternative also requires reconstructing track on the Southern Triangle, which is common to all rail alternatives, including the New Bedford Main Line and the Fall River Secondary. Infrastructure improvements also include constructing, reconstructing, or widening 43 bridges and constructing or reconstructing 47 railroad at-grade crossings.

This alternative would include eleven new commuter rail stations (Battleship Cove, Taunton Depot, Easton Village, Fall River Depot, Freetown, North Easton, King's Highway, Raynham Park, Stoughton Station, Taunton, Whale's Tooth) and major reconstruction at the existing Canton Center commuter rail stations. This alternative would include two overnight layover facilities, one on the New Bedford Main

Line—the Wamsutta layover facility—and one on the Fall River Secondary—the Weavers Cove East layover facility.

For the electrified option, the traction power system would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

Six of the eleven stations are summarized in the Southern Triangle section. For the segment specific to just the Stoughton Alternative, there are five stations, which include Easton Village, North Easton, Raynham Park, Stoughton and Taunton. Table 4.12-3 lists each REC for Easton Village, North Easton, Raynham Park, Stoughton and Taunton. Taking the Southern Triangle into consideration, there are a total of 29 RECs identified. Seven of the RECs were evaluated as having a "high" impact, 15 RECs were evaluated with "medium" impacts and seven RECs were evaluated as having "low" impacts. A total of approximately 25 structures would be demolished for station construction.

In summary, there is a substantial likelihood that contamination would be encountered and would need to be addressed at Taunton Station. It is less likely that contamination would be encountered at Easton Village and Raynham Park stations. It is unlikely that contamination would be encountered at North Easton Station.

4.12.3.3 Whittenton Alternatives

The Whittenton Alternatives would provide electric or diesel commuter rail service to South Station through Stoughton, connecting to the existing Stoughton Line using the Whittenton Branch through the City of Taunton. Both electric (Whittenton Electric) and diesel (Whittenton Diesel) commuter rail options were evaluated for this alternative.

This alternative requires improvements to track infrastructure along the Stoughton Line; Whittenton Line and Attleboro Secondary. This alternative also requires reconstructing track on the Southern Triangle, which is common to all rail alternatives, including the New Bedford Main Line and the Fall River Secondary. Infrastructure improvements also include constructing, reconstructing, or widening 40 bridges and constructing or reconstructing 54 railroad at-grade crossings.

This alternative would include 11 new commuter rail stations (Battleship Cove, Taunton Depot, Easton Village, Fall River Depot, Freetown, King's Highway, North Easton, Raynham Park, Dana Street, Stoughton and Whale's Tooth) and major reconstruction at the existing commuter Canton rail station. This alternative would include two overnight layover facilities, one on the New Bedford Main Line – the Wamsutta layover facility – and one on the Fall River Secondary – the Weavers Cove East layover facility.

For the electrified option, the traction power system would include two main substations (one in Easton and one in New Bedford), two switching stations (one in Canton and one in Berkley), and six paralleling stations (one in Easton, one in Taunton, two in Freetown, one in New Bedford, and one in Fall River).

Six of the eleven stations (Whale's Tooth, King's Highway, Battleship Cove, Fall River Depot, Freetown and Taunton Depot) are summarized in the Southern Triangle section. For the segment north of Taunton Depot there are five stations, including Dana Street (Whittenton Alternative), Taunton (Stoughton Alternative), Raynham Park, Easton village, North Easton and Stoughton. In addition the Whittenton Alternative would include the Whittenton Branch. Table 4.12-4 lists each of the RECs for Easton Village, North Easton, Raynham Park, Dana Street, Stoughton and Whittenton Branch. A total of approximately

25 structures would be demolished for station construction. Taking the Southern Triangle into consideration, there are a total of 24 RECs identified. Seven of the RECs were evaluated as having a “high” impact, 11 RECs were evaluated with “medium” impacts and six RECs were evaluated as having “low” impacts.

Table 4.12-3 RECs—Stoughton Alternatives

Station	Number of Structures to be Demolished	REC Description	RTN	Relative Impact
Easton Village	0	Fuel Oil Release at Adjoining Property (28 Main Street)	4-19778	Low
		Petroleum and Historic Fill Release at Nearby Property (64 Main Street)	4-10839	Low
North Easton	0	None	Not applicable	Not applicable
Raynham Park	Estimated 16	Historic Use of Site as Truck Maintenance and Industrial Storage	Not applicable	Low
Taunton	1 (also has flooring/slabs from previous buildings destroyed by fires)	Historic Use of Site	Not applicable	High
		Conditions Associated with Release and CERCLIS Listing at Site (100 Arlington Street)	4-374	High
		Conditions Associated with Release at Site (30 William Hooke Lane)	4-403	High
		Conditions Associated with Release at Site (100 Arlington St.)	4-20854	Medium
		Transformer Found at Site (30 William Hooke Lane)	Not applicable	Medium
Stoughton	9	Historic Use of Site		Medium
		Murphy Coal Company On-Site Automotive Repair, Petroleum Storage, and Disposal Site (Off Morton Square) Industrial and Commercial Use and On-Site Disposal Site (25 Brock Street) Former Industrial Property and On-Site Disposal Site (2 Canton Street) Machine Shop (48 Wyman Street)	4-13478 4-13476 4-875, 4-18753, and 4-21470	
		Historic Use: Adjacent Sites	4-11611	Medium
		Chemical Company (24-46 Morton Street) Nearby Disposal Sites and Former Filling Station (825 Washington Street) Current Auto Repair and Former Filling Station (931 Washington Street) Active Drycleaning Business (945 Washington Street) Stoughton Train Station (45 Wyman Street)	4-12937, 4-11868, 4-13560, and 4-13682	

Table 4.12-4 RECs—Whittenton Alternatives

Station	Number of Structures to be Demolished	REC Description	RTN	Relative Impact
Easton Village	0	Fuel Oil Release at Adjoining Property (28 Main Street)	4-19778	Low
		Petroleum and Historic Fill Release at Nearby Property (64 Main Street)	4-10839	Low
North Easton	0	None	Not applicable	Not Applicable
Raynham Park	Estimated 16	Historic Use of Site as Truck Maintenance and Industrial Storage	Not applicable	Low
Dana Street Station	0	Active State-Listed Disposal Site	4-11341	High
		Historic Use of Site and Adjoining Properties (Scrap Yard)	Not applicable Not applicable	Medium
		Former release of pesticides and herbicides on adjacent property	Not Applicable	Low
		Former Rail Yard west of Dana Street	Not applicable	Medium
Whittenton Branch	0	Release History and Observations of Adjoining Property (728 Broadway)	4-16976	High
		Historic Use of Adjacent Property as Industrial Manufacturing	Not applicable	Medium
		Indication of Significant Historical Dumping	Not applicable	Medium
		Transformer Oil Release on Adjacent Property	4-18532	Medium
Stoughton	9	Historic Use of Site		Medium
		Murphy Coal Company On-Site Automotive Repair, Petroleum Storage, and Disposal Site (Off Morton Square) Industrial and Commercial Use and On-Site Disposal Site (25 Brock Street) Former Industrial Property and On-Site Disposal Site (2 Canton Street) Machine Shop (48 Wyman Street)	4-13478 4-13476 4-875, 4-18753, and 4-21470	
		Historic Use: Adjacent Sites	Not Applicable	Medium
		Chemical Company (24-46 Morton Street) Nearby Disposal Sites and Former Filling Station (825 Washington Street) Current Auto Repair and Former Filling Station (931 Washington Street) Active Drycleaning Business (945 Washington Street) Stoughton Train Station (45 Wyman Street)	4-12937, 4-11868, 4-13560, and 4-13682	

4.12.3.4 Layover Facilities

Two layover sites have been identified along the Southern Triangle, including the Weaver's Cove East Layover in Fall River, and the Wamsutta Layover site in New Bedford. For the layover sites, a total of 10 RECs have been identified. Two of the RECs were evaluated as having "high" impacts, four RECs were evaluated with "medium" impacts and four RECs were evaluated as having "low" impacts. Table 4.12-5 lists each of the RECs by layover site. No structures are anticipated to be demolished for the layover sites for station construction.

In summary, there is a substantial likelihood that contamination would be encountered and would need to be addressed Weaver's Cove East layover site. An engineered barrier was constructed at the Wamsutta layover site and contaminated soil was left in place beneath the barrier. There are potential impacts related to exposure during the future excavation or construction at this site.

Table 4.12-5 RECs—Layover Sites

Layover Facility	REC Description	RTN(s)	Relative Impact
Wamsutta	Historic Use of Site as Freight Yard and Placement of Permanent Engineered Barrier Above Impacted Soil at Site	4-118	Medium
	Documented Release at Acushnet Estuary (New Bedford Superfund Site)	4-122	Medium
	Documented Release at Adjoining Property (618 Acushnet Avenue)	4-14791	Low
	Documented Release and Implementation of Activity and Use Limitation at Nearby Property (1 Wamsutta Street)	4-11715	Low
	Documented Release at Nearby Property (New Bedford Main Interceptor)	4-127	Low
Weaver's Cove East	Previous Use of Site as Oil Storage Facility and Documented Petroleum Release on Site	4-749	High
	Previous Use of Adjoining Property as Petroleum Product Distribution Facility and Documented Release (Shell Oil Company, 1 New Street)	4-749	High
	Previous Use of Building on Parcel T-1-38 as Commercial Garage	Not applicable	Medium
	Existence of Underground Storage Tanks (USTs) on Parcel T-1-38	Not applicable	Medium
	Possible Presence of Elevated Concentrations of Metals in Site Soil	Not applicable	Low

4.12.3.5 Summary of Impacts by Alternatives

Each of the alternatives under consideration would require acquisition of properties with RECs that would require further investigation. In each case, remediation or soil/groundwater management during construction could be required. Table 4.12-6 summarizes the number of RECs and the impact that were identified for each alternative.

The Stoughton and Whittenton Alternatives each have at least five high impact RECs that were identified, and these alternatives also have the potential to encounter soil or groundwater contamination. Taunton Station on the Stoughton Alternatives and Dana Street on the Whittenton Alternatives have three and one high impact RECs, respectively that were identified.

Table 4.12-6 Summary of RECs by Alternative*

Alternative	Total Number of Stations	Total Number of RECs	Number of Low Impact RECs	Number of Medium Impact RECs	Number of High Impact RECs
Stoughton Alternatives	11/0	29	5	18	6
Whittenton Alternatives	11/0	32	6	21	5

* Not including Layover facilities

The Stoughton Alternatives and the Whittenton Alternatives would have environmental benefits. Although sites containing RECs could increase construction costs, there would be an environmental benefit associated with remediating contaminated sites, particularly the station sites with known soil and groundwater contamination such as the Taunton Station site. The alternatives that would have the greatest environmental benefits are the alternatives with the most RECs since these properties are the most likely to have contaminated environmental media that would be cleaned up for the proposed South Coast Rail project.

Both layover sites would involve acquisition of properties with RECs that would require further investigation. In each case, remediation or soil/groundwater management during construction could be required. Table 4.12-7 summarizes the number of RECs and the impact that were identified for each layover.

Table 4.12-7 Summary of RECs by Layover Site

Layover	Total Number of RECs	Number of Low Impact RECs	Number of Medium Impact RECs	Number of High Impact RECs
Wamsutta	5	3	2	0
Weaver's Cove East	5	1	2	2

4.12.4 Management of Contaminated Media and Regulatory Compliance

For contaminated property owned by MassDOT, response actions would be required pursuant to the milestones outlined in the MCP. Notification to the DEP would be required if a reporting condition is identified as per the MCP or if OHM is detected in soil and/or groundwater above the applicable standards, referred to as the Reportable Concentrations. An LSP would then most likely need to be retained to verify that notification is required, to further assess and manage the site, direct response actions, and specify procedures for work performed in the contaminated areas, such as soil excavation, in accordance with the MCP and, if need be, to render appropriate Opinions. The LSP would also determine if risk reduction measures are required.

To extend MCP deadlines for response action and report submittals so that the response actions can be coordinated with the construction of the stations, layovers, and expansion of the rail lines, the application for a Special Designation Permit (as per 310 CMR 40.0060 of the MCP) may be warranted.

At many sites containing impacted soil, it is often not possible to reach a regulatory endpoint by using soil excavation and off-site disposal as the only type of remediation. It is advisable to explore other

options such as the re-use of soil in order to minimize the quantity of soil to be excavated and disposed off-site. For low levels of impacted soil where a risk assessment shows an unacceptable risk for current and future unrestricted use, a deed restriction consisting of an AUL may be implemented after construction is completed to meet a regulatory endpoint. As per 310 CMR 40.1012(3) (c) of the MCP, AULs are not required within railroad rights-of-way.

Soil impacted with OHM above the Reportable Concentrations that is encountered during the implementation of the South Coast Rail project would be managed appropriately in accordance with the MBTA Design Construction Standard Specifications, Section 02282, entitled "Handling, Transportation and Disposal of Excavated Material." Preliminary assessment activities may assist in identifying the type and quantity of OHM impacted media which would require management under these protocols and help select the optimal disposal methods and/or destination prior to generation. A summary of the MBTA Specification is provided in the following sections.

4.12.4.1 Management of Impacted Soil

Since contaminated media located on proposed stations and rail rights-of-way may be present from historic releases or urban fill which were not reported to the DEP, a pre-characterization of soils prior to excavation, as recommended by DEP, would be performed. The pre-characterization would consist of a limited subsurface investigation whereby soil samples would be collected, screened, and submitted for laboratory analysis in order to define the nature and extent of contamination in areas where soil disturbance would occur. Based on the pre-characterization described above, a Soil Management Plan would be prepared for the project that is consistent with MBTA specifications.

A Soil Management Plan would be implemented as a waste management tool during soil excavation and removal activities that would occur during construction to ensure soil is property characterized, re-used and/or exported. The primary purpose of the Soil Management Plan is to expedite construction and avoid unexpected costs by minimizing costly off-site disposal and maximizing the re-use of soil within the boundaries of the project.

In order to minimize the need to stockpile and manage the excavated soil, which often can be problematic due to dust, runoff, regulatory time limits on stockpiles, the need for large areas, and impacts to other area, the Soil Management Plan would require the identification of the soil that would be disposed of off-site prior to being excavated, as well as the names of the receiving facilities that would be accepting the soil. It would categorize the soil based on its regulatory status from the specific areas to be excavated. Based on the subsurface investigation analytical results, the soil would fall into four groups, consisting of:

- non-regulated clean;
- soil subject to the anti-degradation policy;
- MCP regulated; and
- RCRA Hazardous Waste.

Re-use and disposal options for each category would then be designated under the Soil Management Plan during construction activities, and soil receiving facilities or destinations would be pre-selected on

either a daily or weekly basis. The soil requiring excavation would be loaded directly into trucks at the site of excavation requiring soil to be removed only once.

Based on the anti-degradation policy and a pre-risk screening which would be performed to determine the risk associated with the current and foreseeable use of the property, the re-use of soil may be possible within the project that is above the MCP standards as long as regulatory endpoints could be met.

Properties with confirmed OHM impacts are generally managed in accordance with the MCP, 310 CMR 40.0000 and associated policies or guidance issued by the DEP. However, depending on the type and concentrations of OHM present at a property, other federal regulations implemented by the U.S. EPA may apply (e.g., Comprehensive Environmental Response, Compensation, and Liability Act of 1980).

Should OHM impacted soil be generated during project-related excavation that requires export or on-site re-use, this material would also need to be properly characterized and managed in accordance with applicable regulations. Proper management would ensure appropriate re-use on the project site to prevent exposure to contaminants or export to appropriate destinations. Characterization may entail the collection of soil samples and analysis for specific parameters specified in the DEP policies for re-use and disposal of contaminated soil. Pre-characterization should eliminate the need to stockpile excess soil onsite pending characterization and if export is needed, generation of the required paperwork. A minimum of ten business days are required for laboratory analysis and approval at a disposal facility or landfill. The stockpiling of soil before characterization on such a large project may lead to delays or outright stoppages of work resulting from management and segregation difficulties and could result in a large volume of soil for which there may not be space to accommodate.

Although re-use should be the preferred option, when characterization of soil after excavation is absolutely necessary, the soil should be segregated into approximately 500-cubic yard sections and placed on and covered with polyethylene sheeting of 10 mil or greater thickness. Covers would be placed on each stockpile at the end of each day’s operations, and would be secured in place to prevent runoff and erosion. A composite soil sample would be collected from each of the 500 cubic yard segments. The soil samples would be submitted for the following, at a minimum, chemical analyses: RCRA 8 metals using Method 6010/7471, VOCs via EPA Method 8260, PCBs via EPA Method 8081, total petroleum hydrocarbons (TPH) via modified EPA Method 8100, SVOCs via EPA Method 8270, reactive cyanide and sulfide using EPA Method SW-846, ignitability using EPA Method 1010, corrosivity using EPA Method 9045, and conductivity using EPA Method 120.1. The specific analyses to be performed will depend upon the requirements of the receiving facility that was selected to accept the soil. Any samples found to contain contaminant concentrations equal to or greater than 20 times their hazardous waste toxicity threshold (*i.e.*, the 20-times rule) would be analyzed for toxicity characteristic leaching procedure (TCLP).

It is assumed that the analysis of pesticides and herbicides would not be required; however, this assumption may be modified based on the requirements of the disposal facility and history of the generator site. Should alternate soil disposal options be pursued (*i.e.*, asphalt batching), analytical requirements may vary depending on the analytical requirements for that facility. Based on the results of the characterization, a Bill of Lading would be prepared to facilitate the export of the soil that would need to be disposed of off-site to the selected disposal facility to ensure that the facility is appropriate to handle the impacted soil. The Bill of Lading would need to be prepared and/or certified by an LSP.

4.12.4.2 Management of Impacted Groundwater

If OHM impacted groundwater is encountered during the implementation of any of the alternatives under consideration, it may also need to be managed in accordance with applicable regulations. If the volume would be limited and subsequent offsite disposal is deemed to be the most cost effective disposal option, the groundwater can be temporarily stored in a 21,000-gallon fractionation tank. It would then be characterized, at a minimum, via laboratory analysis for the following parameters: VOCs via EPA Method 8260, TPH via EPA Method 8100 and SVOCS by EPA Method 8720. For managing larger volumes of groundwater, it may be more cost effective to obtain an EPA Construction General Permit or Remediation General Permit for discharge to surface waters/storm drains or a permit from the local sewer authority, if allowed, for discharge to sanitary sewers.

Contaminated groundwater may also need to be dewatered. However, since dewatering is not cost effective, it is not recommended and therefore should be thoroughly assessed before any decision is made as to remediation. When impacted groundwater has originated from an off-site property, the filing of a Downgradient Property Status may be prudent to suspend response actions and compliance fees. However, response actions may still be necessary in order to achieve a regulatory endpoint beyond those required for project construction.

Large quantities of impacted groundwater encountered by construction activities would also be managed with proper permitting. For smaller quantities, groundwater would be pumped into a containerized 20,000-gallon fractionation tank and removed via a manifest for off-site disposal at an approved facility.

4.12.4.3 Management of Hazardous Demolition Debris and Used Railroad Ties

Asbestos-containing materials, including roof flashing, tiles, and other materials may be present in the building materials for the buildings that would be undergoing demolition, based on their age. In addition, lead-based paint, mercury, and PCBs may also be present in the building materials and/or fixtures. It is recommended that prior to demolition a licensed asbestos and hazardous materials contractor sample the building material, including roof flashing, tiles, and other materials, as well as the potential lead-based paint, mercury, and PCBs. If these hazardous materials are found to be present in the structures, then they must be removed by a licensed contractor in accordance with state regulations.

Re-use of building materials, such as asphalt, brick, and concrete, should be considered, as their re-use could reduce disposal costs and may not require a permit. The re-use would depend on whether they are coated with a contaminant or considered “contaminated” based on the concentrations of contaminants present on the material.

Used wooden railroad ties are typically coated with chemical preservatives including creosote which contains SVOCs and would require special handling procedures. The discarded railroad ties must be managed and disposed of in accordance with applicable regulations.

4.12.4.4 Health and Safety Requirements

In addition, health and safety procedures must be followed under the guidelines of the Occupational Safety and Health Administration. All construction workers involved in performing the response actions must be appropriately health and safety trained in accordance with the Occupational Safety and Health

Act (OSHA) of 1970 (Title 29 United States Code, Chapter 15), which mandates specific procedures that must be followed to be protective from exposure to contaminated media.

4.12.4.5 Closure Reports

At the completion of response actions at properties acquired by the applicant for which an RTN was obtained from the DEP, but a closure report consisting of a RAO has not yet been submitted, a condition of No Significant Risk must exist as defined by the MCP. The preferred outcome is a Class A-1 RAO in which contamination is reduced to background levels. In some situations, the confirmatory sampling results may not support a Class A-1 RAO, and in these situations, alternatives would be evaluated to a Class A-1 RAO. DEP would need to be consulted regarding the planning and implementation of demolition and management of contaminated soil to ensure consistency with the applicable regulations.

Additional response actions beyond those necessary for project construction may be necessary at some of these properties in order to achieve regulatory closure. Such foreseeable response actions could occur pursuant to the MCP as permitted under provisions such as those of a RAM plan, Special Designation Permit, or others, and applicable MCP policies pertaining to construction and waste management.

4.12.5 Temporary Construction-Period Impacts

Mitigation measures during construction may include special handling, dust control, and management and disposal of contaminated soil and groundwater in order to prevent construction delays and to provide adequate protection to workers and any nearby sensitive receptors. All response actions must ensure that any nearby or adjacent receptors are adequately protected.

4.12.5.1 Recommendations

Based on the conclusions of the Phase I ESAs that were performed for the rail alignments, proposed stations, and layovers, the following section describes the recommendations and mitigation measures to be performed prior to and during construction of these stations, track segments, and/or layovers. Recommendations are also discussed below for the Stoughton right-of-way based on an environmental database review that was performed in 2001, since track work and retaining wall construction would be performed along the right-of-way. The recommendations for Phase II ESAs would be to determine existing environmental conditions for property acquisitions and would not consist of soil pre-characterization as part of the Soil Management Plan described above.

Rail Alignments

The track segments where land acquisition or substantial new construction is required include the Whittenton Branch for the Whittenton Alternatives, as well as the Stoughton Line right-of-way for the Stoughton Alternatives. The recommendations for these track segments are described in the following section.

Stoughton Line Right-of-Way (Stoughton and Whittenton Alternatives)

Potential contamination along the Stoughton Line that may require further investigation include the following.

- Cyn Environmental Services located in Stoughton is a state hazardous waste spill site, UST location, and RCRA corrective action site. The site is currently adequately regulated outside of the MCP. Potential soil and groundwater contamination in the right-of-way would be assessed by the applicant prior to construction.

- North Easton Historical Industrial Area is a state hazardous spill site where several USTs have been removed. Unknown material was used for undergrade bridge fill at Main and Bridge Streets. Soil contamination in the right-of-way would be assessed by the applicant prior to construction.

- Petroleum contamination was documented at DeAngelis Iron Works in Easton. The applicant would assess potential soil contamination in the right-of-way prior to construction.

- General Cable Corporation in Taunton is a state hazardous waste spill site and contains a UST. Soil and groundwater contamination is documented. The status and remediation of the UST release and assess oil and groundwater contamination in the right-of-way would be researched by the applicant prior to construction.

The Cohen property in Taunton is a designated Superfund site. Potential soil contamination in the right-of-way would be assessed prior to construction.

Whittenton Branch (Whittenton Alternatives)

A Phase II ESA is recommended for Whittenton Branch in the areas of identified medium impact RECs in which limited soil and groundwater sampling would be performed. Response actions would be implemented as necessary to address any soil or groundwater impacts that may be identified.

Stations

Recommendations for the eleven stations, presented in alphabetical order, are described below.

Battleship Cove Station Site

A Phase II ESA was performed in 2002 for Battleship Cove and identified impacted soil above the regulatory criteria. However, since no property acquisition an updated Phase II ESA is not required.

Dana Street Station Site

Prior to construction, it is recommended that a plan be developed to properly handle and manage soil and groundwater that may be contaminated, which would likely incorporate pre-characterization of media requiring management. Soils should be handled in a manner that protects the health and safety of workers, nearby receptors, and visitors to the site. In addition, impacted soil and groundwater should be managed in accordance with applicable regulations and policies prior to leaving the site, should export be required.

Easton Village Station Site

Because only two low impact RECs were identified on adjoining properties, a Phase II ESA is not recommended. Soils excavated as part of construction should be screened for potential contaminants

that may be encountered. In the event that contamination is identified, response actions would be implemented in accordance with the MCP.

Fall River Depot Station Site

A Phase II ESA was performed in 2002 for the northern portion of the Fall River Depot and identified impacted soil above the regulatory criteria and the potential presence of USTs. An updated Phase II ESA is recommended for the Fall River Depot to obtain updated data from the northern portion of the property as well as to obtain soil and groundwater from the southern portion that was not previously assessed. Response actions may be implemented as necessary to address the impacts that were identified. An update of the 2001 comprehensive survey of the existing buildings will be performed by the applicant for the presence of asbestos-containing materials, lead-based paint, and other regulated building materials.

Freetown Station Site

No RECs were identified at this location; however, soils excavated would be screened as part of construction for potential contaminants that may be encountered. In the event that contamination is identified, response actions would be implemented in accordance with the MCP.

King’s Highway Station Site

Although several RECs were identified at this location, since no property acquisition or station construction is planned, a Phase II ESA is not recommended.

North Easton Station Site

No RECs were identified at this location; however, soils excavated as part of construction would be screened for potential contaminants that may be encountered. In the event that contamination is identified, response actions would be implemented in accordance with the MCP.

Raynham Park Station Site

A Phase II ESA is recommended for Raynham Park in which limited soil and groundwater sampling would be performed. Response actions would be implemented as necessary to address any soil or groundwater impacts that may be identified. A comprehensive survey would be performed of the existing structures for the presence of asbestos-containing materials, lead-based paint, and other regulated building materials.

Stoughton Station Site

Hazardous materials mitigation measures should be incorporated during preliminary and final design of the relocated Stoughton Station. In accordance with DEP requirements, any materials that would be excavated from the project area should be pre-characterized to determine course of action for removal. The specific mitigation measures recommended for oil and hazardous materials are: (1) Prepare a Hazardous Materials and Solid Waste Management Plan, and a Health and Safety Plan, to describe the regulatory context and procedures to be used during construction; (2) Pre-characterize any materials that would be managed during the project to determine the course of action for excavation and disposal. Such pre characterization may include subsurface investigations to determine the nature and extent of any soil or groundwater contamination present; (3) Pre-characterize construction materials in

buildings that would be demolished to identify special or hazardous waste and determine the course of action for removal and disposal; and (4) Pre-characterize any railroad infrastructure that would be removed, such as ties, to determine the course of action for removal and disposal.

Taunton Depot Station Site

No RECs were identified at this location; however, soils excavated as part of construction would be screened for potential contaminants that may be encountered. In the event that contamination is identified, response actions would be implemented in accordance with the MCP.

Whale's Tooth Station Site

An engineered barrier was constructed at Whale's Tooth and contaminated soil was left in place beneath the barrier. There are potential impacts related to exposure during the future excavation or construction at this site. Since known contamination is present at the site but buried beneath an engineered barrier, no soil disturbance or subsurface investigation, including a Phase II ESA, is recommended.

Layover Facility Sites

Wamsutta Layover Facility Site

An engineered barrier was constructed at the Wamsutta Layover site and contaminated soil was left in place beneath the barrier. There are potential impacts related to exposure during the future excavation or construction at this site if soil disturbance below the barrier were to occur. Since known contamination is present at the site but buried beneath an engineered barrier, no soil disturbance or subsurface investigation is recommended, including a Phase II ESA.

Weaver's Cove East Layover Facility Site

A Phase II ESA is recommended for the Weaver's Cove East Layover site, since potentially substantial impacts are likely. The comprehensive surficial and subsurface investigation would address soil and groundwater impacts. Response actions would be implemented as necessary to address environmental media that may be identified.

4.13 GEOLOGY AND SOILS

4.13.1 Introduction

This chapter presents an overview of the physical environment found within the study area of the South Coast Rail alternatives, focusing on physical geography, bedrock and surficial geology, and soils. The chapter evaluates potential impacts of the proposed alternatives to geology and soils, including long-term changes to geologic structures or faults, to bedrock, soils, or geologic stability, to seismicity, or to the rock and soil units surrounding excavations.

4.13.2 Existing Conditions

4.13.2.1 Geology

The South Coast Rail alternatives are situated within the Seaboard Lowland physiographic province of southern New England. The present topography of this region is the result of preglacial, glacial, and postglacial erosion and deposition. During the Wisconsin Period, approximately 17,500 years ago, the advance and retreat of the continental ice mass eroded and picked up bedrock, realigned drainages, and deposited till, erratics, and other glacial material along its course. The slow retreat of the ice sheet, estimated to have been about 2 miles thick at its maximum stage in this region, depressed, shaped, and scoured the landscape, leaving widespread glacial deposits. This resulted in a moderately thick veneer of ice-deposited glacial till, a heterogeneous mix of clay, silt, sand, gravel, and boulders through which bedrock occasionally outcrops. The melting of the Wisconsin ice sheet redeposited meltwater and carried stratified drift throughout the river valleys and lowland areas, which resulted in a variety of small-scale landforms.

Flat-topped terraces of sand and gravel, known as kame terraces, were formed along valley walls by meltwater streams. Sinuous, low ridges of sand and gravel, known as eskers, were deposited by streams running through channels in the ice mass. Stratified deposits of glacial outwash formed broad areas called outwash plains. These plains are typically flat topped, well drained, relatively free of boulders, close to water, and clustered in riverine valley settings. Masses of stagnant ice that had become detached from the glacier were surrounded or partly covered by sand and gravel outwash from the melting glacier. When the detached mass of ice melted, the drift settled and left crater-like pits or kettle holes.

The northern portion of the rail alternatives is situated near the Fowl Meadow section of the Neponset River drainage, which is underlain by sedimentary and igneous rocks belonging to several formations. The primary bedrock units near the project are the Pondville conglomerate and the Wamsutta formation. The Pondville conglomerate consists of cobble and boulder conglomerate and some gray coarse sandstone. The Wamsutta formation is mostly a fine-grained red sandstone with interbedded shale and some gray pebble conglomerate. These sedimentary formations extend in a broad band about 2 miles wide, oriented roughly east/west across the Fowl Meadow area.

The primary bedrock unit of igneous rocks to the north and west of the Fowl Meadow area is the Dedham Granodiorite, a medium- to coarse-grained, light pinkish gray granite rock. Within this formation are small intrusions of the Mattapan Volcanic Complex, which consists of felsite flow, pyroclastic rocks (gray/pink felsite) and small dikes of felsite. To the north of the project area in Canton are the Blue Hills outcrops of volcanic (rhyolite) and contact metamorphic rocks (hornfels) that represent a lithic source area of regional significance in the prehistory of southern New England.

The Whittenton Branch (Whittenton Alternative) is situated in the Narragansett Basin, a structural basin extending from the headwaters of the Taunton River near the Norfolk and Bristol County line south to Narragansett Bay. The Narragansett basin is composed of a sedimentary rock base overlain by glacial deposits. It is one of five Pennsylvania-age basins in eastern Massachusetts, all of which are characterized by generally low-grade metamorphism and by graywacke suites with arkose, plutonic pebbles in the coarser sedimentary rocks, and few orthoquartzites. Volcanic rocks are virtually lacking in this basin with the exception of the Wamsutta Formation. The bedrock geology of the project area is characterized by a substratum of the basin known as the Rhode Island Formation. This formation consists of shale and slate coal-bearing beds intercalated with sandstone and conglomerates.[1]

During the Wisconsin Period, the final glacial episode, the glacier stagnated during its retreat and deposited outwash sands and gravels over the till deposit. Large glacial lakes formed as ice dams trapped glacial meltwaters. The glaciolacustrine and glaciofluvial (types of sediments indicating glacial lakes) deposits formed kame deltas, varved (laminated) clay deposits, and kame terraces, consisting of medium to coarse sand. Glacial Lake Taunton, which covered most of the Taunton River drainage basin also formed.[2] Upon drainage of this lake, large quantities of sediment were transported across the area's low-lying sections and wind redeposited fine sediments to eventually cover topographic features. This wind-blown mantle is as deep as 180 centimeters in some locations.[3] Glacially deposited materials within the project area consist of sediments deposited by glacial outwash, with nearly level (0 to 3 percent) and gently sloping (3 to 8 percent) surfaces.

4.13.2.2 Soils

Soil is produced "through the action of climate, plant and animal life, and humans on parent material in different topographic locations over time".[4] Parent material determines the mineralogical composition and contributes largely to the physical and chemical characteristics of the soil. Glacial ice picked up and ground bedrock, which it then transported and deposited as a jumbled mixture of fresh unweathered rock particles of varying sizes. These sediments were separated and sorted by glacial meltwater and strong winds that distributed fine particles. Vegetation became established, chemical processes of weathering increased, and rock sediments developed into soils. Differences in regional soils are primarily attributed to the interaction of the five factors of soil formation: the parent material, climate, living organisms, relief, and time. The soils in the region have developed over a relatively short span of time, in the approximately 15,000 years since the final retreat of the glaciers. A detailed description of soils and their characteristics is provided in Chapter 4.11, *Farmland Soils*.

Stoughton Alternative

The Stoughton Line (Stoughton Alternative) rail right-of-way and related stations are situated in a wide range of soil classifications, most of which were formed on glacial outwash plains. Major soil types classified along the right-of-way include Windsor, Hinckley, and Agawam series along with Udorthents and Mucks. The range of soil types is variable within specific microenvironments along the project corridor.

Windsor series consists of excessively drained loamy sands on outwash plains. These soils formed in medium and fine sand. Most areas are wooded with white pine and oak. Hinckley series soils formed in

[1] Emerson 1917; Hartshorn 1960, 1976; Zen et al. 1983
[2] Hartshorn 1967:39
[3] Ibid.
[4] USDA 1989:111

thick deposits of water-sorted sand and gravel and occur mainly on terrace escarpments, eskers and kames. Subsoils in this series contain sand, gravel, and cobblestones. These soils are gravelly and low in moisture-holding capacity and are low in organic-matter content. Slope and droughtiness severely limit the use of this soil type for crops or pasture.

Agawam series consists of well-drained, nearly level or gently sloping soils that formed in thick deposits of water-sorted sandy material. These soils are nearly free of gravel to a depth of 1 meter. They occupy plains and terraces along the Taunton River and its tributaries. The Udorthents consist of areas of mineral soils that have been drastically altered by grading and cut-and-fill operations in construction of highways, schools, shopping centers and industrial parks.[5]

Muck consists of very poorly drained soils that formed in an accumulation of organic material decomposed to the extent that the original plant material cannot be readily identified. These soils occupy low areas or depressions that receive surface runoff from nearby higher lying areas. The water table is at or near the surface throughout much of the year.[6]

Whittenton Alternative

The Whittenton Branch (Whittenton Alternative) right-of-way and related station are situated in a wide range of soil classifications. Major soil types classified along the right-of-way include Hinckley, Scarboro, Windsor, and Urban Land series with smaller amounts of Deerfield, Wareham, Pits-Udorthents, and Freetown Muck.[7] The Hinckley and Windsor series are described above. The Scarboro series consists of deep, very poorly drained soils on glacial outwash plains. The soils formed in glacial outwash material derived mainly from granite and gneiss. Urban land consists of areas covered by structures including industrial areas, shopping centers, parking lots and roads.

The Deerfield series consists of deep, moderately well-drained soil on the lower parts of glacial outwash plains. The soils are loamy sand near or adjacent to streams and rivers and formed in glacial outwash derived mainly from granite, gneiss, and quartzite. The Wareham series consists of deep, poorly drained and somewhat poorly drained soils on outwash plains, deltas, and stream terraces. The soils are loamy sand primarily found in depressions and formed in sandy glacial outwash.[8]

The Pits-Udorthents consists of areas that have been excavated for sand and gravel. Depth of excavations ranges from about 5 to 25 feet, and some extend into the water table. Included in this unit are pits that consist of loamy material or that have been used as disposal areas for a wide variety of material. Some areas, especially steep banks, have little or no vegetation while some areas are covered with native species such as bayberry, sweet fern, pitch pine, and gray birch. Freetwon Muck consists of nearly level, deep, very poorly drained soils on uplands and outwash plains. The soils formed in thick deposits of organic material and are located in depressions.

Peat consists of very poorly drained soils that formed in an accumulation of partly decomposed organic material where the plant remains can be readily identified. The Gloucester and Norwell series formed in glacial till derived mainly from granite and gneiss. Gloucester soils are somewhat excessively drained and are very stony loamy sand with surface stones 1 to 3 feet in diameter. Norwell soils are poorly drained extremely stony sandy loam and occupy small, low areas on gently rolling ground moraines.

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[5] USDA 1981
[6] Ibid
[7] USDA 1981
[8] Ibid

4.13.3 Analysis of Impacts

4.13.3.1 No-Build (Enhanced Bus) Alternative

The No-Build Alternative (Enhanced Bus) would consist of enhancing current bus service along existing roads and highways. Construction activities would be limited to the modification of three existing Park and Ride facilities, requiring limited clearing and excavate ion No long-term changes would be expected to geologic structures or faults, to bedrock, soils, or geologic stability, to seismicity, or to the rock and soil units surrounding excavations.

Maintenance and development activities within the South Coast Rail project area would be expected to continue, and would create changes in the built environment, but would not adversely impact soils and geologic conditions. Normal geologic processes, such as erosion and sedimentation, would also continue. No specific impacts with respect to soils or geology would be anticipated under the No-Build Alternative.

4.13.3.2 Build Alternatives

As described in detail in Chapter 3, *Alternatives*, the South Coast Rail Build Alternatives would involve subsurface disturbance as a result of the following construction activities:

- Minor repairs or rehabilitation of existing track in active use
- Constructing an additional track on an existing active track segment
- Restoring track and train traffic on out-of-service or abandoned rights-of-way
- Constructing commuter rail stations
- Constructing overhead catenary to allow electrified train service
- Constructing traction power stations
- Construction of layover and maintenance facilities
- Creation of construction staging and laydown areas and construction access roads

Soil and rock affected by the Build Alternatives would be excavated and disturbed during construction. Once a Build Alternative is operational, no further potential long-term impacts to the underlying bedrock geology or soils would be anticipated due to the elements of the Build Alternatives, identified above, including track improvements or construction of new structures such as the trestle in the Hockomock ACEC.

None of the Build Alternatives would require tunneling or other deep excavation that would significantly affect geological conditions. Most disturbance activities would encompass a relatively small area within or adjacent to previously disturbed areas and infrastructure. These include active rail and abandoned rail beds (Stoughton Line and Whittenton Branch) that have previously been established to be compatible with subsurface conditions. No long-term changes would be expected as a result of the Build Alternatives to geologic structures or faults, to bedrock, soils, or geologic stability, to seismicity, or to the rock and soil units surrounding excavations.

No long-term adverse impacts to soils and geology would occur with the Build Alternatives; therefore, no mitigation would be required.

4.14 BIODIVERSITY, WILDLIFE, AND VEGETATION

4.14.1 Introduction

This chapter describes the biological resources and evaluates impacts, both direct and indirect, within and adjacent to the South Coast Rail project corridors in terms of biodiversity, including plant communities, fish and wildlife, and vernal pool habitat for each alternative and its project elements. Threatened and Endangered Species are described in Chapter 4.15. Background information on the proposed project and a summary of each of the alternatives under consideration are provided in Chapter 2 and Chapter 3. Regulatory jurisdiction and compliance with local, state, and federal regulations is discussed as well as measures to minimize, mitigate and compensate for impacts.

This section provides information relative to biodiversity and associated regulations, identifies the Project study area and provides a regional overview of biodiversity including BioMap and Living Water Core Habitats, plant communities, fish and wildlife. Section 4.14.2 describes existing conditions within the study area, relative to biodiversity and Section 4.14.3 describes potential impacts and mitigation measures.

4.14.1.1 Resource Definition

Biological diversity, or “biodiversity,” is an assessment of the numbers, types, and relative abundance of plant and animal species in natural communities. It also describes their relationships to each other and their interactions with the environment. There are three levels of biodiversity; the first is based on the genetic differences among individuals, the second on species richness (i.e. the abundance or rarity of species in a landscape), and the third on the variety of habitats, communities, ecosystems, and landscapes in which those species occur. The concept of biodiversity plays an important role in the connections within and between these levels, and how the interrelated elements sustain the system as a whole. Higher levels of biodiversity are important in maintaining robust ecological communities. This report evaluates the species richness and the variety of habitats, communities, ecosystems, and landscapes in which those species occur within the study area.

All biotic community analyses were conducted in accordance with the requirements of NEPA of 1969;[1] CEQ’s *Incorporating Biodiversity Considerations Into Environmental Impact Analysis Under the National Environmental Policy Act*.[2] In January 1993, the CEQ, in conjunction with the USEPA, prepared a report on biodiversity and how biodiversity conservation can be incorporated into NEPA analyses. CEQ’s *Incorporating Biodiversity Considerations Into Environmental Impact Analysis Under the National Environmental Policy Act* is intended to assist federal agencies in fulfilling their responsibilities under NEPA in the context of biological diversity, by identifying situations where consideration of biodiversity under NEPA is appropriate and to strengthen their effects to do so.[3] For this chapter, biodiversity is described primarily in terms of important wildlife and vegetative resources or “biotic communities” that are known to occur in the South Coast Rail study area. Biotic communities are populations of different organisms including fish, wildlife, and plants that live together in a particular place. Biotic communities are ecological systems in which the natural resources are interdependent. Rare species represent one of

[1] National Environmental Policy Act of 1969, as amended. Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, § 4(b), Sept. 13, 1982.

[2] Council on Environmental Quality. Incorporating Biodiversity Considerations into Environmental Impact Analysis under the National Environmental Policy Act. Washington, DC: U.S. Council on Environmental Quality. TIC: 241456. (1993).

[3] Ibid.

the most sensitive elements of biodiversity and are addressed specifically in Chapter 4.15, *Threatened and Endangered Species*.

4.14.1.2 Regulatory Context

There are currently no applicable federal or state regulations that specifically regulate biodiversity. However, federal and state laws (Endangered Species Act)[4,5] protect rare plants and animals and their critical habitats, and state regulations (Wetland Protection Act)[6] protect the wildlife habitat value of wetlands. Vernal pool habitats are protected under the Massachusetts Water Quality Certification[7] standards as Outstanding Resource Waters. The consequences of the proposed South Coast Rail alternatives are evaluated for comparative purposes under the environmental jurisdiction of MEPA and NEPA. The Secretary's Certificate on the Environmental Notification Form (ENF) identified the need for (1) a baseline ecological assessment and maps and graphics indicating biodiversity values for the project area and (2) a description of the indicators and metrics used to assess biodiversity, including the weighting system used to differentiate among habitat values.

The requirements of the Secretary's Certificate on the DEIR are summarized below:

- The FEIR should include the results of breeding bird surveys and other studies conducted to refine the wildlife impact assessment and mitigation plans. The mitigation plans should include time of year restrictions to protect migratory birds, which are protected under the National Migratory Bird Treaty.

- The FEIR should update the vernal pool inventory and impact assessment for the Stoughton Alternative to clarify vernal pool and vernal pool habitat impacts, as agreed by the Interagency Coordinating Group, and to inform the proposed mitigation plan

- The FEIR should include details on the existing conditions at stream crossings, and explain where culverts will be replaced, extended, or modified. The designs for proposed culverts, bridges, or other alterations at stream crossings should incorporate the Massachusetts River and Stream Crossing Standards.

- The FEIR should evaluate potential direct and indirect hydrological changes, opportunities for maximizing hydrological connections between wetlands for enhancement and restoration as well as for flood capacity, and impacts to fish, amphibians, reptiles, and other wildlife passage.

- The FEIR should include an analysis of spans and open bottom arches to meet Stream Crossing Standards, and consider such arches as mitigation measures throughout the entire rail alignment to the extent they are practicable to improve fish and wildlife passage, and do not interfere with safe train operations.

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[4] Endangered Species Act of 1973, Section 7(16 USC 1531 et seq., as amended), United States Fish and Wildlife Service.
[5] Massachusetts Endangered Species Act of 1990 (MESA [321 CMR 10.00: MGL c. 131A.]), Natural Heritage Endangered Species Program.
[6] Massachusetts Wetlands Protection Act regulations (WPA [310 CMR 10.00 et seq.]).
[7] Massachusetts Water Quality Certification (Section 401 of the Clean Water Act [MGL c. 21 §§ 26 – 53]).

- The FEIR should include mitigation proposals for any unavoidable impacts from bridges and culverts.

- The FEIR should include a summary of the CAPS analysis of ecological integrity impacts associated with the proposed project and the results of additional analysis on the proposed improvements in the Index of Ecological Integrity (IEI) as a result of proposed mitigation measures.

4.14.1.3 State Wildlife Action Plan

The State Wildlife Action Plan (September 2006) is a Comprehensive Wildlife Conservation Strategy (CWCS) developed by the Massachusetts Division of Fisheries and Wildlife (DFW) with the goal of conserving wildlife biodiversity in Massachusetts. The CWCS describes past successful efforts to conserve the biodiversity of the Commonwealth and a review of the landscape changes that have affected wildlife populations. It identifies species and habitats in the greatest need of conservation and lists the primary strategies that DFW plans to use to conserve these species and their habitats through coordination and partnerships with governmental and non-governmental agencies and organizations.

The CWCS identifies seven broad conservation strategies for species and habitats in greatest need of conservation. These include: habitat protection, surveys and inventories of the CWCS species and habitats, conservation planning, environmental regulation, habitat restoration and management, coordination and partnerships, and conservation/environmental education.

The CWCS does not designate specific areas for protection of high diversity. However, it proposes specific conservation actions for each habitat. A summary of common conservation actions among these habitats includes:

- Determining Species Habitat Polygons for each current occurrence of a state-listed animal;

- Locating, mapping, and field-surveying a selected percentage of habitats that are used by rare and uncommon animals;

- Conducting research and surveying for habitats and species of greatest conservation needs that are under-surveyed in Massachusetts;

- Protecting land and areas along waters that support populations of rare and uncommon animals;

- Regulating and limiting the impacts of development on habitats used by state-listed animals;

- Coordinating and working with local agencies and other organizations;

- Identifying and implementing new and old restoration efforts within these habitats and documenting their effects on rare and uncommon species;

- Funding and researching the natural history of animals found within these habitats;

- Informing and educating the public and local decision makers about the value of habitat and species biodiversity and issues related to their conservation; and

- Monitoring and assessing the effectiveness of these conservation actions.

Habitat types found within the study area are discussed below.

4.14.2 Existing Conditions

4.14.2.1 Regional Overview

This chapter includes a general description of the study area and identifies the associated bioregions and major concentrations of Core Habitats along the project corridors.

Study Area

The South Coast Rail study area is considered to be the region of southeastern Massachusetts consisting of southern Bristol and Plymouth Counties, bordering on Buzzards Bay or Mount Hope Bay, including the cities of Fall River and New Bedford and nearby towns. For purposes of this chapter, the study area is the portion of the South Coast region that is adjacent to or crossed by the Build Alternatives. Potential impacts are evaluated in Section 4.14.3 to include all mapped cover types within the proposed limits of work, regardless of the distance from the track center line.

Within the study area, the corridors associated with the alternatives intersect areas that contain wetlands and undeveloped ecosystems that provide higher biodiversity value than other portions of the corridors. Areas of important biodiversity value include wetland areas such as the Hockomock Swamp, Pine Swamp, Assonet Cedar Swamp, Acushnet Cedar Swamp, and Forge Pond, and upland areas such as the Freetown-Fall River State Forest (Figure 4.14-1). Several of these ecosystems are within ACECs, such as the Hockomock Swamp ACEC (Figure 4.14-2). ACECs are described in detail in Chapter 4.10, *Protected Public Open Space and Areas of Critical Environmental Concern*. Relevant Biodiversity features associated with project alternatives are shown on Figures 4.14-3, 4.14-4, 4.14-5, and 4.14-6.

Bioregions

Bioregions are relatively large land areas characterized by broad, landscape-scale descriptions of their natural features and the environmental processes that influence functions of the entire ecosystem.[8] The USEPA defines Bioregions as Ecoregions which are "*areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components.*"[9]

Bioregions provide a useful means for simplifying and reporting on more complex patterns of biodiversity, because they include large-scale geophysical patterns in the landscape that are linked to the faunal and floral assemblages and processes at the ecosystem scale. Bioregions vary in size since they can be defined by different criteria, including physical or ecological criteria such as watersheds or associations of biological communities. For example: The USEPA has identified a set of 13 "ecoregions" in Massachusetts based on geology, hydrology, climate, and the distribution of species. The study area is within the ecoregion called "Bristol Lowland/Narragansett Lowland" which is defined as a region that

[8] Department of Environment and Climate Change, New South Whales Government. Website accessed January 2009. (http://www.environment.nsw.gov.au/bioregions/BioregionsExplained.htm).

[9] U.S. Environmental Protection Agency (EPA),Ecoregions of Massachusetts, Connecticut, and Rhode Island. Website accessed January 2009. (http://www.epa.gov/wed/pages/ecoregions/mactri_eco.htm).

has flat, gently rolling plains, the forests are mostly central hardwoods, and there are numerous wetlands, cranberry bogs, and rivers that drain this area.

Most of the study area is within the Taunton River watershed as defined by the Massachusetts Department of Fish and Game Riverways Program.

As defined by the U.S. North American Bird Conservation Initiative (NABCI) Committee, the entire project area is within the New England/Mid-Atlantic Coast Bird Conservation Region (BCR). BCRs are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues.

Southeastern Massachusetts Bioreserve

Portions of the study area are within the Southeastern Massachusetts Bioreserve. The bioregion concept can be used to guide land management practices adopted in protected areas such as bioreserves. The Southeastern Massachusetts Bioreserve was designated in 2002 and includes approximately 13,600 acres of land just east of Fall River. The Bioreserve is composed of land units owned and managed by separate entities, including the Commonwealth of Massachusetts, the City of Fall River, and The Trustees of Reservations, a nonprofit land conservation organization. The Bioreserve includes 5,150 acres of the Freetown-Fall River State Forest, 360 acres of the Acushnet Wildlife Management Area, 4,300 acres of watershed and conservation lands owned by the City of Fall River, and 3,800 acres of the former Acushnet Saw Mills property that were acquired by the Commonwealth of Massachusetts and The Trustees of Reservations. The purpose of the Bioreserve is "to protect, restore and enhance the biological diversity and ecological integrity of a large scale ecosystem representative of the region; to permanently protect public water supplies and cultural resources; to offer interpretive and educational programs; and to provide opportunities for appropriate public use and enjoyment of this natural environment."[10]

The Bioreserve is managed under a joint management plan that covers several aspects, including forest and wildlife management, water supply protection, and public access. Figure 4.14-1 illustrates the major land units that are part of the Bioreserve.

Important Bird Areas

An Important Bird Area (IBA) is an area that provides important habitat to one or more species of breeding, wintering, and/or migrating birds.[11] These areas are designated as part of an international effort to protect bird habitat around the world. The Massachusetts Audubon Society has designated two Important Bird Areas (IBAs) within the study area: the Hockomock Swamp and the Freetown-Fall River State Forest/Southeastern Massachusetts Bioreserve. Figure 14.14-1 illustrates the major land units that are part of these IBAs. A list of bird species found in the study area and the types of habitat that they require is provided in Table 4.14-1.

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[10] Green Features, Facts about the Southeastern Massachusetts Bioreserve. Website accessed January 2009. (http://www.greenfutures.org/projects/green/biofacts.html).

[11] Massachusetts Audubon Society, Massachusetts Important Bird Areas. Website accessed January 2009. (http://massaudubon.org/Birds_and_Birding/IBAs/index.php).

Hockomock Swamp IBA

Hockomock Swamp IBA is a 5,126-acre area located in Bridgewater, Easton, Norton, Taunton, West Bridgewater, Bridgewater, and Plymouth. It includes three state-owned wildlife management areas (WMA): the Hockomock Wildlife Management Area, the Wilder Wildlife Management Area, and West Meadows Wildlife Management Area. This IBA provides important migratory/stopover habitat as well as nesting habitat.

The Hockomock Swamp IBA has been reported to contain nine breeding and/or wintering/migrant state-listed species, and at least 47 regional and five state high conservation priority species. Very abundant species are gray catbird (*Dumetella carolinensis*), northern waterthrush (*Seiurus noveboracensis*), common yellowthroat (*Geothlypis trichas*), swamp sparrow (*Melospiza georgiana*), common grackle (*Quiscalus quiscula*), and veeries (*Catharus fuscescens*). State-listed species within this IBA include: grasshopper sparrow (*Ammodramus savannarum*), short-eared owl (*Asio flammeus*), upland sandpiper (*Bartramia longicauda*), common moorhen (*Gallinula chloropus*), king rail (*Rallus elegans*), sharp-shinned hawk (*Accipiter striatus*), northern harrier (*Circus cyaneus*), least bittern (*Ixobrychus exilis*), and pied-billed grebe (*Podilymbus podiceps*).

The major habitat types found within this IBA include oak-conifer forest, cultivated grassland, cultivated field, emergent freshwater wetland, palustrine woodland swamp, shrub-scrub wetland, lake/pond, and river/stream.

Freetown-Fall River State Forest/ Southeastern Massachusetts Bioreserve IBA

The Freetown-Fall River State Forest/Southeastern Massachusetts Bioreserve IBA is a 15,000-acre area located in the towns of Freetown, Fall River, and Bristol. It includes the Freetown-Fall River State Forest, the Acushnet Cedar Swamp, and the Southeastern Massachusetts Bioreserve. This area supports important avian habitat diversity, especially in the Rattlesnake Brook area, and provides important migratory/stopover habitat as well as nesting habitat. Because of the Bioreserve designation, there is a focus on habitat management, research, and monitoring of flora and fauna. Some of the bird monitoring efforts include: Christmas Bird Counts, spring migration bird counts, Breeding Bird Surveys, and Biodiversity Day events. Christmas Bird Counts and Breeding Bird Surveys have been conducted since 1970.

The Freetown-Fall River State Forest/Southeastern Massachusetts Bioreserve IBA has been reported to contain one breeding and/or wintering/migrant state-listed species, and at least seven regional and one state high conservation priority species. Very abundant species include the Eastern towhee (*Pipilo erythophthalmus*), ovenbird (*Seiurus aurocapillus*), and prairie warbler (*Dendroica discolor*). The migrant state-listed species reported to use the site is the Northern parula (*Parula americana)*.

The major habitat types found within this IBA include northern hardwoods forest, oak-conifer forest, pitch pine (*Pinus rigida*)/scrub oak (*Quercus ilicifolia*), early successional shrubland, power line, shrub-scrub wetland, and river/stream.

BioMap Core Habitats

The Natural Heritage and Endangered Species Program (NHESP) published the BioMap Report in 2001. While the report and mapping was updated as BioMap 2 in 2010,[12] the analysis for the DEIS had already been completed and is based on the data provided in the original edition. This study was undertaken to identify critical land in Massachusetts needed to preserve biodiversity in the Commonwealth and is based, in part, on rare species and locations of exemplary natural community in the state. The BioMap Report identified Core Habitats as areas representing "the rare and exemplary habitat of Massachusetts" and Supporting Natural Landscapes as "buffer areas around Core Habitat." The BioMap (BM) Core Habitats encompass nearly 1.4 million acres of uplands and wetlands in Massachusetts. Areas of BioMap Core Habitat that have been mapped within the study area include parts of the Southeastern Massachusetts Bioreserve, Freetown-Fall River State Forest, Acushnet Cedar Swamp, Assonet Cedar Swamp, Hockomock Swamp, and Pine Swamp. Threatened and endangered species are described in detail in Chapter 4.15. The major concentrations of BioMap Core Habitat in the study area are shown on Figures 4.14-1 and 4.14-2 and include:

- Acushnet Cedar Swamp, the Freetown-Fall River State Forest, and the Assonet Cedar Swamp (BM1229) are located in New Bedford, Freetown, and Lakeville (Figures 4.14-3a-e and 4.14-4a and b). This BioMap core habitat contains extensive, minimally fragmented and diverse natural communities that range from forested swamp and bogs (large coastal and alluvial Atlantic white cedar (*Chamaecyparis thyoides*) swamps), to a dry upland pitch pine scrub oak community. This large Core Habitat is an important site that supports several species of rare plants, rare turtles and salamanders, as well as rare moths, butterflies, dragonflies, and damselflies.

- Forge Pond and Assonet River (BM1232) in Freetown provide habitat for the attenuated bluet damselfly (*Enallagma daeckii*) (Figure 4.14-4a).

- Hockomock Swamp (BM1166 and BM1168) is located within the Hockomock Swamp ACEC in Raynham, Easton, Bridgewater, and West Bridgewater and contains the largest unfragmented and pristine areas of wetland habitat in eastern Massachusetts (Figures 4.14-5c-d).[13] These Core Habitats include the highest quality acidic graminoid fen and the largest coastal Atlantic cedar swamp in Massachusetts and a very large red maple (*Acer rubrum*) swamp community. This assemblage provides habitat for several rare insects, rare salamanders and turtles, as well as rare plant species.

- Pine Swamp (BM1196) in Raynham includes an unfragmented Atlantic white cedar swamp that provides habitat for the rare Hessel's hairstreak butterfly (*Callophrys hesseli*) (Figure 4.14-5d).

Living Waters Core Habitats

In 2003, NHESP completed the Living Waters project. Living Waters are critical sites (Core Habitats) of freshwater biodiversity identified within rivers, streams, lakes, and ponds in Massachusetts. Designated

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[12] Massachusetts Department of Fish & Game and The Nature Conservancy. 2010. BioMap2: Conserving the Biodiversity of Massachusetts in a Changing World. Commonwealth of Massachusetts, DFG Natural Heritage and Endangered Species Program, Westborough, MA, 60pp.

[13] Hockomock Swamp ACEC website: (http://www.mass.gov/dcr/stewardship/acec/acecs/l-hcksmp.htm).

Living Waters in the study area are shown on Figures 4.14-3d, 4.14-4a-b, and 4.14-5e. The major Living Waters found within the study area include:

- Acushnet Cedar Swamp and Turner Pond (LW239) in New Bedford provide habitat for the rare coastal swamp amphipod (*Synurella chamberlain)* and the rare American clam shrimp (*Limnadia lenticularis*) (Figure 4.14-3d).

- Sections of Rattlesnake Brook (LW321) and the Assonet River (LW330) in Freetown provide habitat for several anadromous fishes including blueback herring (*Alosa aestivalis*), rainbow smelt (*Osmerus mordax*), and white perch (*Morone americana*) (Figures 4.14-4a-b).

- Taunton River (LW080) in Taunton provides habitat for the state-listed endangered Atlantic sturgeon (*Acipenser oxyrinchus*), which was listed as an endangered species at the federal level by the National Marine Fisheries Service in 2012 (Figures 4.14-3a and 4.14-5e).

Plant Communities

This section describes the plant communities within the study area grouped into wetland cover types and upland cover types. These community types are based on the NHESP's "*Classification of Natural Communities*" but include some refinements of these types to reflect local conditions.[14] The cover type data was produced based on interpretation of GIS aerial mapping, as well as land use data and wetlands cover type data available from MassGIS.

Wetland Cover Types

Wetland cover types include red maple swamp, Atlantic white cedar swamp, mixed forested wetland, shrub swamp, marshes and fens, and open water. Wetland resources in the study area are described in Chapter 4.16, *Wetlands*.

Red Maple Swamp (RM)

The red maple swamp community is the most abundant community within the study area, as it is throughout southeastern Massachusetts wetlands. The community type includes a red maple overstory, with understory vegetation consisting of highbush blueberry (*Vaccinium corymbosum*), sweet pepperbush (*Clethra alnifolia*), swamp azalea (*Rhododendron viscosum*), common winterberry (*Ilex verticillata*), skunk cabbage (*Symplocarpus foetidus*), cinnamon fern (*Osmunda cinnamomea*), and sensitive fern (*Onoclea sensibilis*). In the Cowardin classification system, these areas are characterized as Palustrine Forested Wetland (PFO), with the ecological subcategory of Wooded Swamp Deciduous (WSD).

Inland Atlantic White Cedar Swamp (AWC)

The Atlantic white cedar swamp is listed by NHESP as a Priority Natural Community. This community type includes Atlantic white cedar in association with red maple, fetterbush (*Leucothoe racemosa*), common winterberry, swamp azalea, cinnamon fern, and royal fern (*Osmunda regalis*). This community also occurs within the Pine Swamp. The Hockomock Swamp and Assonet Cedar Swamp AWC

[14] Natural Heritage Endangered Species Program, Classification of Natural Communities. Website accessed February 2009: (http://www.mass.gov/dfwele/dfw/nhesp/nhclass.htm).

communities consist generally of small to medium sized trees with some larger trees in Assonet Cedar Swamp as well. The size classes of trees indicate that cedar lumber was harvested in these areas during the 18th and 19th centuries, as occurred in most New England AWCs. In the Cowardin classification system, these areas are characterized as Palustrine Forested Wetland (PFO), with the ecological subcategory of Wooded Swamp Coniferous (WSC).

Mixed Forested Wetland (RM/AWC)

The mixed forested wetland community (RM/AWC) is associated with transition areas between Atlantic white cedar swamps and red maple swamps, and transition areas between wetland and upland communities. This community consists of a mixture of deciduous and evergreen overstory trees, and understory shrubs. Dominant plants may include red maple, Atlantic white cedar, highbush blueberry, fetterbush, common winterberry, swamp azalea, sphagnum moss (*Sphagnum* spp.), and cinnamon fern. In the Cowardin classification system, these areas are characterized as Palustrine Forested Wetland (PFO), with the ecological subcategory of Wooded Swamp Mixed (WSM).

Shrub Swamp (SS)

Shrub swamp communities are transition zones between the open water and marshes of the river and the surrounding forested wetlands and uplands. The shrub swamp community includes speckled alder (*Alnus incana*), pussy willow (*Salix discolor*), red-osier dogwood (*Cornus amomum)*, buttonbush (*Cephalanthus occidentalis*), arrow-wood (*Viburnum dentatum*), sensitive fern, and skunk cabbage. In the Cowardin classification system, these areas are characterized as Palustrine Shrub Scrub (PSS) Wetlands.

Marshes and Fens (M)

Marshes are characterized by shallow, standing water throughout the year and have limited shrub and tree cover. Vegetation is generally dominated by herbaceous species such as reeds, sedges, rushes, and grasses. Acid fen plant communities are listed by NHESP as a Priority Natural Community. This community includes sphagnum mosses and sedges with a limited shrub cover of leatherleaf (*Chamaedaphne calyculata*), bog rosemary (*Andromeda glaucophylla*), and Labrador tea (*Ledum groenlandicum*). In the Cowardin classification system, these areas are characterized as Palustrine Emergent Marsh (PEM) Wetlands.

Open Water (W)

This community includes the estuary of Taunton River and Mount Hope Bay as well as a range of fisheries and wildlife habitat such as rivers, ponds, coldwater and warmwater brooks and streams. Coastal plain ponds occupy depressions in glacial outwash plains that are directly linked to the underground aquifer. The coastal plain pondshore community occurs in those ponds with no surface inlet or outlet, and with a gradual slope to the shore. In the Cowardin classification system, these areas are characterized as Open Water (POW) Wetlands.

Permanent ponds and waterways within the study area include Black Brook, Snake River, Assonet River, Taunton River, Neponset River, Three Mile River, Forge Pond, and Turner Pond. Shallow and slow moving portions of this community may be vegetated by aquatic plant species such as fragrant water lily (*Nymphaea odorata*). Areas of open water with deeper and faster flowing waters are generally unvegetated.

Upland Cover Types

Upland cover types include deciduous forest, coniferous forest, mixed forest, agricultural use, developed land, powerline easements, and cleared areas.

Deciduous Forested Upland (UD)

Vegetation within this mixed oak community includes northern red oak (*Quercus rubra*), red maple, gray birch (*Betula populifiolia*), mountain laurel (*Kalmia latifolia*), teaberry (*Gaultheria procumbens*), nannyberry (*Viburnum lentago*), and wild lily-of-the-valley (*Maianthemum canadense*).

Coniferous Forested Upland (UC)

Vegetation within this successional white pine forest community includes eastern white pine, eastern hemlock, mountain laurel, and poison ivy (*Toxicodendron radicans*).

Mixed Forested Upland (C/D)

The mixed forested upland oak-hemlock-white pine community is found within the Freetown-Fall River State Forest and it is the second largest community type within the Hockomock Swamp. This forested community consists of northern red oak, red maple, gray birch, white pine, eastern hemlock (*Tsuga canadensis*), mountain laurel, teaberry, nannyberry, and wild lily-of-the-valley.

Agricultural Use (AG)

Agricultural areas include land in active agricultural use that support cultivated crops or cranberry bogs.

Powerline (P)

Powerline easements occupy wide strips of maintained land that crosses portions of the study area. Both uplands and wetlands occur within this area along maintained access roads. Vegetation growing under the powerlines is maintained by seasonal cutting and herbicide application as part of a vegetation management plan. Due to the artificial nature of its boundaries, this community type includes a variety of both wetlands and uplands with a corresponding diversity of soil types.

Cleared Area (CL)

The cleared areas are generally located along the powerlines. They consist of excavated gravel pits and are largely unvegetated due to clearing activities. This is considered to be a habitat type because some wildlife species may use these cleared areas as suitable habitat for breeding, nesting, and migration.

Wildlife

The study area includes wildlife habitat areas for a diversity of species. These areas include several large wetland complexes and protected upland habitat. These areas possess characteristics that are necessary for maintaining and expanding wildlife populations, particularly area-sensitive species. The wildlife value of these areas is increased by the adjacent undeveloped uplands, which provide habitat for upland species along with breeding and overwintering habitat for wetland-dependent wildlife.

This section provides an overview of the range of wildlife species likely to exist within the study area. The analysis of vertebrate species is based, in part, on wildlife habitat analysis performed using the

NEWILD computer model for the 2002 Final EIR (Stoughton Alternative). The NEWILD computer model was developed by the U.S. Department of Agriculture, Northeastern Research Station as part of the NED project, a program to develop software tools to support ecosystem management decision making.[15] Other literature used to determine occurrences are referenced at the end of each vertebrate list.

Birds

Table 4.14-1 lists bird species that may potentially occur within the Hockomock Swamp and other important habitat areas along the project corridors. The list includes species that may breed in the study area, as well as species that may stop over on migratory flights or overwinter. The table also indicates whether species are area-sensitive (require large areas of unfragmented forest), require forest interior or edge habitats, and the types of vegetation that the species utilizes. Some of the species found in the study area are opportunists that can be found in a variety of habitat types, while some species are more specialized and occur in a narrower range of habitat types.

Table 4.14-1 Potential Bird Species Found Within the Study Area

				Area				
Common Name	**Scientific Name**	**Wetland**	**Habitat Use[1]**	**Hockomock**	**Pine Swamp**	**Assonet**	**Freetown -Fall River**	**Acushnet**
Great blue heron	*Ardea herodias*	X	--	X	X	X	X	
Mute swan	*Cygnus olor*	X	-	X	X	X	X	X
Canada goose	*Branta canadensis*	X	--	X	X	X	X	X
Wood duck[2]	*Aix sponsa*	X	--	X	X	X	X	
Gadwall	*Anas strepera*	X	-					X
American black duck	*Anas rubripes*	X	--				X	
Mallard	*Anas platyrhynchos*	X	--		X	X	X	X
Hooded merganser	*Lophodytes cucullatus*	X	--	X			X	
Osprey	*Pandion haliaetus*	X	--		X	X	X	X
Cooper's hawk	*Accipiter cooperii*		--		X			X
Red-shouldered hawk	*Buteo lineatus*		I/E	X	X	X	X	X
Broad-winged hawk	*Buteo platypterus*		I			X	X	X
Red-tailed hawk	*Buteo jamaicensis*		E	X	X	X	X	X
Wild turkey	*Meleagris gallopavo*		I/E	X	X	X	X	X
Ruffed grouse	*Bonasa umbellus*		I/E				X	
Northern bobwhite	*Colinus virginianus*		I/E					X
Killdeer	*Charadrius vociferus*		--		X	X	X	X
Spotted sandpiper	*Actitis maculata*	X	--			X	X	X
American woodcock	*Scolopax minor*	X	E	X	X	X	X	X

[15] Thomasma, S.A.; L. Ebel; and M.J. Twery. 1998. NEWILD (Version 1.0) user's manual (computer program).

Common Name	Scientific Name	Wetland	Habitat Use[1]	Area Hockomock	Pine Swamp	Assonet	Freetown -Fall River	Acushnet
Mourning dove	*Zenaida macroura*		E	X	X	X	X	X
Yellow-billed cuckoo	*Coccyzus americanus*		I/E	X				
Black-billed cuckoo	*Coccyzus erythrophthalmus*		I/E			X		
Eastern screech owl	*Otus asio*		--		X			X
Great horned owl	*Bubo virginianus*		--			X		X
Barred owl	*Strix varius*		I			X	X	X
Whip-poor-will	*Caprimulgis vociferus*		--				X	
Chimney swift	*Chaetura pelagica*		--	X	X	X	X	X
Ruby-throated hummingbird	*Archilochus colubris*		E	X		X		X
Belted kingfisher	*Ceryle alcyon*	X	--		X		X	
Red-bellied woodpecker	*Melanerpes carolinus*		I/E	X	X	X	X	X
Downy woodpecker	*Picoides pubescens*		I/E	X	X	X	X	X
Hairy woodpecker	*Picoides villosus*		I	X	X	X	X	
Northern flicker	*Colaptes auritus*		I/E	X	X	X	X	X
Eastern wood pewee	*Contopus virens*		I/E	X	X	X	X	X
Eastern phoebe	*Sayornis phoebe*		I/E	X	X	X	X	X
Great crested flycatcher	*Myiarchus crinita*		I/E	X	X	X	X	X
Eastern kingbird	*Tyrannus tyrannus*		E	X	X	X	X	X
Tree swallow	*Iridoprocne bicolor*		E	X	X	X	X	X
N. rough-winged swallow	*Stelgidopteryx serripennis*		--		X		X	
Bank swallow	*Riparia riparia*		--			X		X
Barn swallow	*Hirundo rustica*		--	X	X	X	X	X
Blue jay	*Cyanocitta cristata*		I/E	X	X	X	X	X
American crow	*Corvus brachyrhynchos*		E	X	X	X	X	X
Fish crow	*Corvus ossifragus*		--	X	X	X		
Black-capped chickadee	*Parus atricapillus*		I/E	X	X	X	X	X
Tufted titmouse	*Parus bicolor*		I/E	X	X	X	X	X
Red-breasted nuthatch	*Sitta canadensis*		I/E			X	X	
White-breasted nuthatch	*Sitta carolinensis*		I/E	X	X	X	X	X
Brown creeper	*Certhia americana*		I	X			X	
House wren	*Troglodytes aedon*		E	X	X	X	X	X

				Area				
Common Name	Scientific Name	Wetland	Habitat Use[1]	Hockomock	Pine Swamp	Assonet	Freetown -Fall River	Acushnet
Carolina wren	*Thryothorus ludovicianus*		--	X	X	X	X	X
Blue-gray gnatcatcher	*Polioptila caerulea*		I/E			X	X	X
Eastern bluebird	*Sialia sialis*		E	X	X	X	X	
Veery	*Catharus fuscescens*		I	X	X	X	X	X
Hermit thrush	*Catharus guttatus*		I				X	
Wood thrush	*Hylocichla mustelina*		I/E	X	X	X	X	X
American robin	*Turdus migratorius*		E	X	X	X	X	X
Gray catbird	*Dumetella carolinensis*		I/E	X	X	X	X	X
Northern mockingbird	*Mimus polyglottus*		E		X	X	X	X
Brown thrasher	*Toxostoma rufum*		E				X	
Cedar waxwing	*Bombycilla cedrorum*		E	X	X	X	X	X
European starling	*Sturna vulgaris*		E	X	X	X	X	X
Warbling vireo	*Vireo gilvus*		E	X	X			
Yellow-throated vireo	*Vireo flavifrons*		E	X				
White-eyed vireo	*Vireo griseus*		E			X		
Red-eyed vireo	*Vireo olivaceous*		I/E	X	X	X	X	X
Blue-winged warbler	*Vermivora pinus*		E	X	X	X	X	X
Chestnut-sided warbler	*Dendroica pensylvanica*		E			X	X	
Black-and-white warbler	*Mniotilta varia*		I	X	X	X	X	X
Black-throated green warbler	*Dendroica virens*		I			X	X	
Prairie warbler	*Dendroica discolor*		E	X	X	X	X	X
Pine warbler	*Dendroica pinus*		I	X	X	X	X	X
Yellow warbler	*Dendroica petechia*	X	E	X	X	X	X	X
Canada warbler	*Wilsonia canadensis*		I				X	
Hooded warbler	*Wilsonia citrina*		I/E				X	
Worm-eating warbler	*Helmitherus vermivorus*		I/E				X	
Ovenbird	*Seiurus aurocapillus*		I	X	X	X	X	X

Common Name	Scientific Name	Wetland	Habitat Use[1]	Area				
				Hockomock	Pine Swamp	Assonet	Freetown -Fall River	Acushnet
Northern waterthrush	*Seiurus noveboracensis*	X	I	X	X	X	X	
Louisiana waterthrush	*Seiurus motacilla*	X	I	X	X			
Common yellowthroat	*Geothlypis trichas*	X	I/E	X		X	X	X
American redstart	*Setophaga ruticilla*		I	X		X	X	X
Scarlet tanager	*Piranga olivacea*		I	X	X		X	X
Eastern towhee	*Pipilo erythophthalmus*		I/E	X	X	X	X	X
Chipping sparrow	*Spizella passerina*		E	X	X	X	X	X
Field sparrow	*Spizella pusilla*		E	X	X	X	X	X
Savannah sparrow	*Passerculus sandwichensis*		--		X			
Song sparrow	*Melospiza melodia*		E	X	X	X	X	X
Swamp sparrow	*Melospiza georgiana*	X	E	X	X	X		X
Rose-breasted grosbeak	*Pheucticus ludovicianus*		I/E	X	X	X	X	X
Northern cardinal	*Cardinalis cardinalis*		I/E	X	X	X	X	X
Indigo bunting	*Passerina cyanea*		E	X	X	X	X	X
Bobolink	*Dolichonyx oryzivorus*		E					X
Red-winged blackbird	*Agelaius phoeniceus*	X	E	X	X	X	X	X
Common grackle	*Quiscalus quiscula*		E	X	X	X	X	X
Brown-headed cowbird	*Molothrus ater*		E	X	X	X	X	X
Orchard oriole	*Icterus spurius*		E	X	X		X	X
Baltimore oriole	*Icterus galbula*		E	X	X	X	X	X
Purple finch	*Carpodacus purpureus*		I/E	X			X	X
House finch	*Carpodacus mexicanus*		E	X	X	X	X	X
American goldfinch	*Carduelis tristis*		E	X	X	X	X	X
House sparrow	*Passer domesticus*		E	X	X	X	X	X

Habitat Use: I = Interior (nest only within forest interiors, rarely near forest edge); I/E = Interior/Edge – territories located entirely within the forest but can only use edges; E = Edge – species use forest perimeters, nearby fields or large clearings during breeding season.

Source: Freemark, K. and B. Collins. 1992. Landscape ecology of birds breeding in temperate forest fragments. Pages 443-454 in *Ecology and conservation of neotropical migrant landbirds*, J.M. Hagan III and D.W. Johnston, eds. Smithsonian Institution Press, Washington, DC.

Shading indicates forest-interior breeding bird species

As described in the section on Important Bird Areas, the Massachusetts Audubon Society has designated two IBAs within the study area, the Hockomock Swamp and the Freetown-Fall River State Forest/Southeastern Massachusetts Bioreserve, which includes the Acushnet Cedar Swamp State Reservation. These areas provide habitat for breeding birds of concern, as well as migratory and overwintering habitat for both wetland and upland bird species.

Mammals

Mammals are a diverse class of vertebrates that inhabit a wide variety of community types and niches. The list of mammals expected to be found within the study area was generated using the NEWILD computer program and supplemented with *New England Wildlife: Habitat, Natural History, and Distribution*[16] and other reference lists of mammals of Massachusetts.

With the exception of the northern water shrew (a state-listed species not identified by NHESP as inhabiting the Hockomock Swamp), the list includes all mammal species identified as likely inhabitants of the Hockomock Swamp in the publication *Hockomock Wonder Wetland*.[17]

Table 4.14-2 presents the list of mammal species that may find suitable feeding, breeding, and/or overwintering habitat within the study area. The Habitat Usage column lists each community type that may provide habitat for the individual species.

Reptiles, Amphibians, and Fish

Natural areas and waterways throughout the study area provide habitat for common and state-listed reptiles, amphibians, and fish. Previous studies have identified populations of some uncommon species of turtles such as the Eastern box turtle (*Terrapene carolina*), Blanding's turtle, spotted turtle (*Clemmys guttata*), and salamanders such as the blue-spotted salamander and the four-toed salamander (*Hemidactylium scutatum*) within the Hockomock Swamp wetlands. Table 4.14-3 lists the reptiles and amphibians that are likely to be found within the study area.

Table 4.14-2 Potential Mammalian Species Found Within the Study Area

Common Name	Scientific Name	Habitat Usage[1]
Virginia opossum	*Didelphis virginiana*	RM, SS, M, W/U, UD, C/D, P
Masked shrew	*Sorex cinereus*	RM, AWC, RM/AWC, SS, M, W/U, UD, UC, C/D, P
Smoky shrew	*Sorex fumeus*	RM, AWC, RM/AWC, W/U, UD, UC, C/D
Northern short-tailed shrew	*Blarina brevicauda*	RM, AWC, RM/AWC, SS, M, W/U, UC, C/D, P
Star-nosed mole	*Condylura cristata*	RM, AWC, RM/AWC, SS, M, W, W/U
Hairy-tailed mole	*Parascalops breweri*	W/U, UD, UC, C/D, P
Eastern mole	*Scalopus aquaticus*	AG, D, P
Little brown myotis	*Myotis lucifugus*	SS, M, W, AG, D, P
Keen's myotis	*Myotis keenii*	SS, M, W, AG, D, P
Silver-haired Bat	*Lasionycteris noctivagans*	SS, M, W, AG, D, P
Eastern pipistrelle	*Pipistrellus subflavus*	SS, M, W, AG, D, P
Big brown bat	*Eptesicus fuscus*	SS, M, W, AG, D, P

[16] DeGraaf, R. M., and Yamasaki, M. 2001. *New England wildlife: habitat, natural history, and distribution*. University Press of New England, Lebanon, NH, 482pp.
[17] Anderson, K.S. n.d. *Mammals In Hockomock Wonder Wetland*. Mass. Audubon Society, Lincoln, 34 p.

Common Name	Scientific Name	Habitat Usage[1]
Red bat	*Lasiurus borealis*	RM, SS, M, W, W/U, UD, UC, C/D, AG, P
Hoary bat	*Lasiurus cinereus*	SS, M, W, W/U, UD, UC, C/D, AG, P
Eastern cottontail	*Sylvilagus floridanus*	SS, M, AG, D, P
New England cottontail	*Sylvilagus transitionalis*	RM, AWC, RM/AWC, SS, M, W/U, UD, C/D, P
Snowshoe hare	*Lepus americanus*	RM, AWC, RM/AWC, SS, W/U, UD, UC, C/D, P
Eastern chipmunk	*Tamias striatus*	RM, W/U, UD, UC, C/D, P
Gray squirrel	*Sciurus carolinensis*	RM, W/U, UD, C/D, D
Red squirrel	*Tamiasciurus hudsonicus*	RM, AWC, RM/AWC, W/U, UD, UC, C/D, D
Southern flying squirrel	*Glaucomys sabrinus*	W/U, UD, C/D, D
Beaver	*Castor canadensis*	RM, SS, M, W, W/U, UD, C/D
Woodchuck	*Marmota monax*	AG, D, P
White-footed mouse	*Peromyscus leucopus*	RM, AWC, RM/AWC, SS, W/U, UD, UC, C/D, D, P
Southern red-backed vole	*Clethrionomys gapperi*	RM.AWC, RM/AWC, SS, W/U, UC, C/D
Meadow vole	*Microtus pennsylvanicus*	SS, M, W, P
Woodland vole	*Microtus pinetorum*	RM, W/U, UD, C/D, P
Muskrat	*Ondatra zibethicus*	SS, M, W
Norway rat	*Rattus norvegicus*	AG, D, P
House mouse	*Mus musculus*	AG, D, P
Meadow jumping mouse	*Zapus hudsonius*	RM, SS, M, P
Woodland jumping mouse	*Napaeozapus insignis*	RM, AWC, RM/AWC, SS, W/U, UD, UC, C/D, P
Coyote	*Canis latrans*	RM, AWC, RM/AWC, SS, M, W/U, UD, UC, C/D, AG, P
Red fox	*Vulpes vulpes*	RM, AWC, RM/AWC, SS, M, W/U, UD, UC, C/D, AG, P
Gray fox	*Urocyon cinereoargenteus*	RM, AWC, RM/AWC, SS, M, W/U, UD, C/D, P
Raccoon	*Procyon lotor*	RM, AWC, RM/AWC, W/U, UD, UC, C/D, AG, D, P
Ermine	*Mustela erminea*	RM, AWC, RM/AWC, SS, W/U, UD, UC, C/D, AG, P
Long-tailed weasel	*Mustela frenata*	RM, AWC, RM/AWC, SS, M, W/U, UD, UC, C/D, P
Mink	*Mustela vison*	RM, AWC, RM/AWC, SS, M, W
Striped skunk	*Mephitis mephitis*	RM, SS, W/U, UD, UC, C/D, AG, P, D
River otter	*Lutra canadensis*	RM, AWC, RM/AWC, SS, M, W
Bobcat	*Felis rufus*	RM, AWC, RM/AWC, SS, W/U, UD, UC, C/D, P
White-tailed deer	*Odocoileus virginianus*	RM, AWC, RM/AWC, SS, W/U, UD, UC, C/D, AG, P

[1] Habitat: RM-red maple swamp; AWC-Atlantic white cedar swamp; RM/AWC-red maple/Atlantic white cedar swamp mix; SS-shrub swamp; M--marsh/fen; W-open water; W/U-wetland/upland forested mix; UD-deciduous upland forest; UC-coniferous upland forest; C/D-mixed upland forest; AG-agricultural land; D-developed; P-powerline easement; CL-cleared land (gravel pits).

Table 4.14-3 Potential Amphibian and Reptilian Species Found Within the Study Area

Common Name	Scientific Name	Habitat[1]
Amphibians		
Blue-spotted salamander	*Ambystoma laterale*	RM, AWC, RM/AWC, SS, M, W, W/U, UD, C/D
Spotted salamander	*Ambystoma maculatum*	RM, AWC, RM/AWC, SS, M, W, W/U, UD, C/D
Marbled salamander	*Ambystoma opacum*	RM, AWC, RM/AWC, SS, M, W, W/U, UD
Eastern newt	*Notophthalmus viridescens*	RM, AWC, RM/AWC, SS, M, W, W/U, UD, C/D
Northern dusky salamander	*Desmognathus fuscus*	RM, AWC, RM/AWC, SS, M, W, W/U, UD, C/D
Eastern red-backed salamander	*Plethodon cinereus*	RM, AWC, RM/AWC, SS, M, W, W/U, UD, UC, C/D
Four-toed salamander	*Hemidactylium scutatum*	RM, AWC, RM/AWC, SS, W/U, UD, C/D
American toad	*Bufo americanus*	W/U, UD, AG, D, P, CL
Fowler's toad	*Bufo fowleri*	RM, RM/AWC, SS, M, W/U, P
Spring peeper	*Pseudacris crucifer*	RM, AWC, RM/AWC, SS, M, W
Gray treefrog	*Hyla versicolor*	RM, SS, W, W/U
American bullfrog	*Rana catesbeiana*	RM, SS, M, W,
Green frog	*Rana clamitans*	RM, AWC, RM/AWC, SS, M, W, W/U, UD, P
Pickerel frog	*Rana palustris*	RM, RM/AWC, SS, M, W, W/U, UD, C/D
Northern leopard frog	*Rana pipiens*	M, P
Wood frog	*Rana sylvatica*	RM, AWC, RM/AWC, SS, M, W, W/U, UD, P
Reptiles		
Snapping turtle	*Chelydra serpentina*	M, W, W/U, P
Eastern musk turtle	*Sternotherus odoratus*	W, M, P
Painted turtle	*Chrysemys picta*	RM, RM/AWC, SS, M, W, W/U, UD, C/D, P, CL
Spotted turtle	*Clemmys guttata*	RM, RM/AWC, SS, M, W, W/U, UD, C/D, P, CL
Blanding's turtle	*Emydoidea blandingii*	RM, RM/AWC, SS, M, W, W/U, UD, C/D, P, CL
Wood turtle	*Clemmys insculpta*	RM, RM/AWC, SS, W
Eastern box turtle	*Terrapene carolina*	RM, RM/AWC, SS, M, W/U, UD, C/D, AG, D, P, CL
Eastern racer	*Coluber constrictor*	AG, P, CL
Ringnecked snake	*Diadophis punctatus*	RM, CL, P, UC, UD, C/D
Milksnake	*Lampropeltis triangulum*	AG, D, P, CL
Northern watersnake	*Nerodia sipedon*	RM, AWC, RM/AWC, SS, M, W
Smooth greensnake	*Opheodrys vernalis*	RM, W/U, UD, P
Dekay's brownsnake	*Storeria dekayi*	RM, RM/AWC, SS, M, W/U, UD, C/D, AG, D, P, CL
Red-bellied snake	*Storeria occipitomaculata*	RM, SS, UD, C/D, AG, P
Eastern ribbonsnake	*Thamnophis sauritus*	AG, D, P, CL
Common gartersnake	*Thamnophis sirtalis*	RM, AWC, RM/AWC, SS, M, W/U, UD, UC, C/D, AG, D, P, CL

Source: Hunter, M.L., A.J.K. Calhoun, and M. McCollough. 1999. Maine Amphibians and Reptiles. University of Maine Press, Orono, ME. DeGraaf, R.M., and D.D. Rudis. 1983. Amphibians and Reptiles of New England. University of Massachusetts Press; Amherst, MA.

1 Habitat: RM = Red maple; AWC = Atlantic white cedar; RM/AWC = red maple Atlantic white cedar mix; SS = shrub swamp; M = marsh/fen; W = open water; W/U = wetland/upland forested mix; UD = deciduous forested upland; UC = coniferous forested upland; C/D = upland mixed forest; AG = agricultural; D = developed; P = powerline; CL = cleared land (*e.g.,* gravel pit).

The Taunton River, in particular, is an important anadromous fish run that supports the Atlantic sturgeon (a federally and state-listed endangered species). Based on information provided by the DMF and DFW, there are 34 freshwater, anadromous, or diadromous fish recorded in the waterways crossed by the Stoughton Alternative. Although several other species have been recorded from the lower, saline, reaches of the Taunton River (bluefish, *Pomatomus saltatrix*; crevalle jack, *Caranx hippos*; winter flounder, *Pseudopleuronectes americanus*) these fish are not found in freshwater. Salt water extends 12.6 miles inland from the mouth of the Taunton River, which is approximately 2 miles below the point where the New Bedford Main Line crosses the Taunton River south of Ingells Street (Weir Junction). Table 4.14-4 lists the fish species that are documented by NHESP to occur within the study area.

Vernal Pools

Vernal pools are generally small, seasonally-inundated wetland depressions that lack a permanent, population of predatory fish, provide breeding habitat for amphibians (wood frogs, *Rana sylvatica*; and ambystomid salamanders), and may also be utilized by reptiles and other wildlife. Numerous vernal pools, including NHESP certified and potential vernal pools occur adjacent to the railroad embankment and other locations within the study area. These are small pools or seasonal ponding areas within bordering vegetated wetlands, or small isolated wetlands. Certified vernal pools (CVPs) are field verified and documented vernal pools that have been certified by the NHESP according to the *Guidelines for the Certification of Vernal Pool Habitat* (2009[18]). They are included as points in the MassGIS data layer. Potential vernal pools (PVPs) are unverified, vernal pool habitats with a MassGIS data layer produced by the NHESP to help locate likely vernal pools across the state. Potential vernal pools do not receive protection under the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00), or under any other state or federal wetlands protection laws. With the exception of a new vernal pool identified in 2009 (VP-13), no other vernal pools occur within the railroad embankment, although there are numerous vernal pools adjacent to the right-of-way. In several locations there are clusters of vernal pools, which may have higher wildlife habitat value than single, isolated pools.

Vernal pool investigations of the right-of-way were conducted in 2000-2001 for the Stoughton Alternative and were documented in the 2002 Final EIR. Additional surveys were conducted in the spring of 2008 and 2009 along the, Stoughton Line and Whittenton Branch. In 2008 the surveys were conducted within portions of the right-of-way along the inactive Stoughton Main Line in Stoughton, Easton, and Raynham. In 2009 the surveys were conducted within portions of the right-of-way in Stoughton, Taunton, Easton and Raynham along the inactive Stoughton Main Line and Whittenton Branch.

Table 4.14-4 Fish Species Potentially Found Within Waterways in the Study Area

Common Name	Scientific Name	Waterway [1, 2]
Alewife	*Alosa pseudoharengus*	Assonet River, Fall Brook, Mill River, Rattlesnake Brook, Taunton River
American eel	*Anguilla rostrata*	Assonet River, Black Brook, Cedar Swamp River, Cotley River, Fall Brook, Mill River, Pine Swamp Brook, Queset Brook, Rattlesnake Brook, Taunton River, Terry Brook, Whitman Brook
American shad	*Alosa sapidissima*	Taunton River
Atlantic menhaden	*Brevortia tyrannus*	Taunton River
Atlantic sturgeon	*Acipenser oxyrhynchus*	Taunton River

[18] Guidelines for the Certification of Vernal Pool Habitat (2009). Massachusetts Division of Fisheries and Wildlife. Natural Heritage and Endangered Species Program.

Common Name	Scientific Name	Waterway [1, 2]
Banded killifish	*Fundulus diaphanous*	Taunton River
Banded sunfish	*Enneacanthus obesus*	Cedar Swamp River, Fall Brook, Rattlesnake Brook
Black crappie	*Pomoxis nigromaculatus*	Mill River, Taunton River
Blacknose dace	*Rhinichthys atratulus*	Taunton River
Blueback herring	*Alosa aestivalis*	Assonet River, Fall Brook, Mill River, Rattlesnake Brook, Taunton River
Bluegill	*Lepomis macrochirus*	Assonet River, Mill River, Queset Brook, Taunton River
Brook trout	*Salvelinus fontinalis*	Cedar Swamp River, Rattlesnake Brook
Brown bullhead	*Ameiurus nebulosus*	Assonet River, Fall Brook, Mill River, Pine Swamp Brook, Rattlesnake Brook, Taunton River
Brown trout	*Salmo trutta*	Rattlesnake Brook
Carp	*Cyprinus empio*	Taunton River
Chain pickerel	*Esox niger*	Assonet River, Cotley River, Fall Brook, Mill River, Taunton River, Whitman Brook
Common shiner	*Notropis cornutus*	Mill River, Taunton River
Creek chubsucker	*Erimyzon oblongus*	Cedar Swamp River, Fall Brook, Taunton River
Fallfish	*Semotilus corporalis*	Taunton River
Gizzard shad	*Dorosoma cepedianum*	Taunton River
Golden shiner	*Notemigonus crysoleucas*	Fall Brook, Taunton River
Inland silverside	*Menidia beryllina*	Taunton River
Largemouth bass	*Micropterus salmoides*	Assonet River, Cotley River, Mill River, Pine Swamp Brook, Taunton River, Whitman Brook
Mummichog	*Fundulus heteroclitus*	Taunton River
Pumpkinseed	*Lepomis gibbosus*	Assonet River, Cotley River, Mill River, Pine Swamp Brook, Taunton River, Whitman Brook
Rainbow smelt	*Osmerus mordax*	Assonet River, Rattlesnake Brook, Taunton River
Rainbow trout	*Oncorhynchus mykiss*	Rattlesnake Brook
Redfin pickerel	*Esox americanus americanus*	Assonet River, Cedar Swamp River, Fall Brook, Mill River, Pine Swamp Brook, Rattlesnake Brook, Taunton River
Striped bass	*Morone saxatilis*	Taunton River
Swamp darter	*Etheostoma fusiforme*	Cedar Swamp River, Cotley River
Tessellated darter	*Etheostoma olmstedi*	Mill River, Queset Brook, Taunton River, Whitman Brook
Tiger trout	*Salmo trutta x Salvelinus fontinalis*	Rattlesnake Brook
White perch	*Morone americana*	Assonet River, Fall Brook, Rattlesnake Brook, Taunton River
White sucker	*Catastomus commersoni*	Taunton River
Yellow perch	*Perca flavescens*	Taunton River

Source: List of species and names of rivers and streams provided by NHESP in a letter dated January 9, 2009.
1 Currently NHESP has no fisheries survey information for Black Brook, Blue Hill River, Lovett Brook, Steep Brook or Terry Brook.
2 Beaver Brook, Rattlesnake Brook and Wading River are annually stocked in the spring with brook trout, brown trout, rainbow trout and/ or tiger trout.

During these investigations, several NHESP-identified potential vernal pools within 100 feet of the right-of-way were inspected for the presence of certification characteristics under NHESP guidance. Previously unidentified vernal pools were located and documented using GPS technology. A summary of results from these vernal pool investigations is included in Section 4.14.2.2. Some of the vernal pool point data available from GIS were found to be incorrectly located when compared to field verified locations and certification forms provided by NHESP. The correct locations for all field verified vernal pools are shown in the figures in Volume II (4.14-7 through 4.14-10).

In April 2009 vernal pool inspections were conducted along the Stoughton Line (within the Hockomock Swamp), in conjunction with NHESP staff. New vernal pools were identified along the Stoughton Line with sufficient evidence of obligate species to allow certification. NHESP has indicated that additional information on these pools will be provided once the certification forms are completed.

In 2010, field work began in order to identify and delineate all wetland resource areas along the Stoughton Alternative. At that time, any additional vernal pools not found during earlier surveys were identified. Visual searches were conducted along the right-of-way to identify any previously unidentified vernal pools. Several NHESP identified potential vernal pools within 100 feet of the right-of-way were inspected for the presence of certification characteristics under NHESP guidance. Previously unidentified vernal pools were located and documented. Some of the vernal pool point data available from MassGIS were found to be incorrectly located when compared to field verified locations and certification forms provided by the NHESP. The locations of all certified, potential, and field verified vernal pool are shown in Figures 4.14-7 through 10.

The June 29, 2011 Secretary's Certificate on the DEIR required a more expansive level of vernal pool assessment, including indirect impacts to upland habitat for vernal pools up to 750 feet on either side of the right-of-way. It is not practicable to conduct complete searches of the entire area within 750 feet from the right-of-way, due to the large area which would require review (approximately 15 square miles) as well as the fact that the vast majority of the land is under private ownership. However, all known certified and potential vernal pools within 750 feet of the right-of-way were used in the impact analysis.

Wildlife Action Plan

The Comprehensive Wildlife Conservation Strategy (CWCS) describes 22 habitats and proposes conservation strategies for each of them. Eleven of these habitats are found within the study area and include:

- Large and mid-sized rivers
- Upland forest
- Large unfragmented landscape
- Small streams
- Shrub swamps
- Forested swamps

- Lakes and ponds
- Young forests and shrublands
- Riparian forest
- Vernal pools
- Marshes and wet meadows

4.14.2.2 Existing Conditions within the Study Corridor

The following describes existing conditions and identifies areas along each segment of the alternatives corridors that have the potential to support important biodiversity elements such as plant communities, wildlife habitat, birds, aquatic life, and fish. These areas are notable because they provide a higher biodiversity value than other segments of the alternatives corridors.

Southern Triangle Study Area (Common to All Rail Alternatives)

All rail alternatives would require improvements to the existing active rail infrastructure south of Cotley Junction in Taunton (the New Bedford Main Line and the Fall River Secondary) (Figures 4.14-3a through e, 4.14-4a through c, 4.14-7e, 4.14-8a through d, and 4.14-9a through c).

Both the New Bedford Main Line and Fall River Secondary are active freight lines with ballasted right-of-way, tracks, and ties. There are culverts that convey streams underneath the embankment. The right-of-way itself does not provide suitable habitat wildlife and the tracks and ties prevent turtles, amphibians, and small mammals from moving across the right-of-way except through the culverts.

New Bedford Main Line

The New Bedford Main Line passes through several areas of Core Habitat including the Acushnet Cedar Swamp and the Assonet Cedar Swamp (BM1229). It is adjacent to one Living Water (LW239) in New Bedford and crosses rivers and streams that are considered important fisheries habitat.

BioMap Core Habitat

BioMap Core Habitat (BM1229) is a large polygon that includes the Assonet Cedar Swamp and the Acushnet Cedar Swamp, which are crossed by the New Bedford Main Line, and the Southeastern Massachusetts Bioreserve, Freetown-Fall River State Forest, which is crossed by the Fall River Secondary.

Assonet Cedar Swamp (BM1229)—Located in Freetown, the Assonet Cedar Swamp is sometimes referred to as the Great Cedar Swamp and borders the Cedar Swamp River and the Assonet River south of Myricks Junction. The extensive wetland contains one of the largest Atlantic white cedar swamps in the state, and supports numerous state-listed species. The Assonet Cedar Swamp includes the Assonet Cedar Swamp Wildlife Sanctuary, a 1,000-acre parcel of conservation land owned by the Massachusetts Audubon Society in Lakeville. The New Bedford Main Line crosses (approximately 5,150 feet) and abuts (approximately 4,550 feet) the Assonet Cedar Swamp for a total of approximately 2 miles (Figures 4.14-3b-c).

Acushnet Cedar Swamp (BM1229)—The Acushnet Cedar Swamp State Reservation is an approximately 1,000-acre property located in New Bedford and Dartmouth, north of the New Bedford Airport. It is an outstanding example of an Atlantic white cedar swamp and provides habitat for state-listed rare wetlands wildlife and other state-listed rare, endangered, or special concern species. This is one of eight cedar swamps in public ownership in Massachusetts, and has been designated by the U.S. Department of the Interior, National Park Service as a National Natural Landmark (36 CFR Part 62). The existing New Bedford Main Line, currently active for freight rail service, forms a major portion of the eastern boundary of the Reservation in New Bedford (Figures 4.14-3c-d). In New Bedford, the Acushnet Cedar Swamp encompasses Living Water Core Habitat (LW239).

Living Waters

The New Bedford Main Line is adjacent to Living Water Core Habitat (LW239) that includes the Acushnet Cedar Swamp and Turner Pond. This Living Water provides habitat for the rare coastal swamp amphipod and the rare American clam shrimp (Figure 4.14-3d). It abuts the track for approximately 0.6 mile south of Route 140 in New Bedford.

Fisheries Habitat

The New Bedford Main Line crosses the Cotley River, Cedar Swamp River, and Fall Brook, which are all important fisheries habitats. Table 4.14-4 lists the fish species that are documented by the Massachusetts Department of Fish and Wildlife to occur within these stream systems.

Vernal Pools

A discussion of vernal pools along the New Bedford Main Line is included in the narrative for the Stoughton Alternative.

Fish and Wildlife Passage

A discussion of fish and wildlife passage along the New Bedford Main Line is included in the narrative for the Stoughton Alternative.

Other Important Habitat Areas

The New Bedford Main Line crosses and is adjacent to large wetland areas located in Berkley, between Route 24 and Myricks Street (Figure 4.14-3a). These wetlands areas are unfragmented open space that could be important wildlife habitat because they may be used as dispersal, migration, breeding, foraging, and as bird stopover areas.

Fall River Secondary

The Fall River Secondary is adjacent to several areas of Core Habitat that includes Forge Pond (BM1232) and the Southeastern Massachusetts Bioreserve, Freetown-Fall River State Forest (BM1229). It is not adjacent to any Living Waters, however it crosses rivers and streams that are considered important fisheries habitats.

BioMap Core Habitat

This section includes a description of the BioMap Core Habitat adjacent to and crossed by the Fall River Secondary.

Forge Pond (BM1232)—Forge Pond is an irregularly shaped surface waterbody located mainly on the southwestern side of the Fall River Secondary in Freetown. A wetland complex of trees, shrubs, and emergent vegetation exists between the bank of the pond and the track in several areas, most notably along the northern portion of the pond. In this area, the wetland complex borders the tracks for approximately 1,100 feet. The track abuts the Forge Pond Core Habitat for approximately 400 feet in Freetown (Figure 4.14-4a).

Freetown-Fall River State Forest (BM1229)—BioMap Core Habitat (BM1229) is a large polygon that includes the Southeastern Massachusetts Bioreserve and Freetown-Fall River State Forest, which are adjacent to the Fall River Secondary, and includes the Assonet Cedar Swamp and Acushnet Cedar Swamp, which are only crossed by the New Bedford Main Line. The Fall River Secondary crosses the Assonet River, which runs through the Assonet Cedar Swamp.

The Freetown-Fall River State Forest is a 5,441-acre property with access from Slab Bridge Road in Freetown. The state forest provides recreational facilities, including a picnic area and 50 miles of unpaved roads and trails used for hiking, mountain biking, horseback riding, and snowmobiling. Hunting and fishing are also popular uses of the state forest, particularly Rattlesnake Brook, which is stocked with brook trout. None of the active public recreation areas or trails is adjacent to the tracks, which are currently used for freight rail service. The Freetown-Fall River State Forest is bounded on the northwest by the existing Fall River Secondary for approximately 1.4 miles in Freetown (Figures 4.14-4a-b). The state forest is part of the Southeastern Massachusetts Bioreserve.

Living Waters

The Fall River Secondary is not adjacent to any Living Waters, however it crosses rivers and streams that are considered important fisheries habitat.

In Freetown, the Fall River Secondary crosses Rattlesnake Brook at the same location where it is crossed by Route 24. North of this location, the track abuts the eastern bank of the Assonet River between Forge Road and Beechwood Road. Farther north in Lakeville, the track crosses the Assonet River. In none of these locations is the track adjacent to (within 100-feet of the track centerline), nor does it cross the areas of Core Habitat that have been designated for sections of Rattlesnake Brook (LW321) and the Assonet River (LW330) (Figures 4.14-4a-b).

Fisheries Habitat

The Fall River Secondary crosses the Assonet River, Rattlesnake Brook, and Terry Brook (Figures 4.14-4a-b) and is adjacent to the Taunton River. These waterways all provide important fisheries habitat. Table 4.14-4 includes fisheries survey results for these habitats.

Vernal Pools

A discussion of vernal pools along the Fall River Secondary is included in the narrative for the Stoughton Alternative.

Fish and Wildlife Passage

A discussion of fish and wildlife passage along the Fall River Secondary is included in the narrative for the Stoughton Alternative.

Other Important Habitat Areas

The Fall River Secondary is not adjacent to nor does it cross any other large unfragmented habitat or protected open spaces.

Stoughton Alternative

The Stoughton Alternative, north of Cotley Junction, includes improvements to existing active freight or rail lines (track sections north of Stoughton Station and from Dean Street to Cotley Junction) and track construction on out-of-service or abandoned rights-of-way (between Stoughton Station and Dean Street or between Whittenton Junction and Route 138 for the Whittenton variant of the Stoughton Alternative (Whittenton Alternative). All alternatives that use the Stoughton line (including the Whittenton variant) would include constructing a trestle through part of the Hockomock Swamp to reduce impacts to wetlands, biodiversity, and rare species. The Stoughton Electric and Diesel Alternatives are illustrated in Figures 4.14-5a-e and 4.14-7a-e.

The Stoughton Line is an inactive line without tracks and ties in most areas. There are culverts that convey streams underneath the embankment. In addition to the culverts, the right-of-way itself provides suitable migratory habitat for wildlife because there are no tracks and ties to prevent turtles, amphibians, and small mammals from moving across the right-of-way. However, the right-of-way does not likely provide suitable nesting, breeding, or foraging habitat for wildlife. This is in part due to disturbance caused by frequent, although unauthorized use of the right-of-way by pedestrians, bicycles, and in particular, all-terrain vehicles (ATVs), which also cause erosion.

Both the Stoughton Alternatives (diesel/electric) (as well as the Whittenton Variant) cross through a Core Habitat polygon that includes the Hockomock Swamp ACEC (BM1166). Unlike the Whittenton variant, the Stoughton Alternatives cross the Pine Swamp (BM1196) in Raynham. Both the Stoughton Alternatives and the Whittenton Variant (Whittenton Alternative) cross the Taunton River near a reach that is mapped as a Living Water Core Habitat (LW080). The Taunton River is identified as providing important fisheries habitat.

BioMap Core Habitat

This section includes a description of the BioMap Core Habitat crossed by the Stoughton Line.

Hockomock Swamp (BM1166)—The Hockomock Swamp ACEC includes approximately 16,950 acres of land in Bridgewater, Easton, Norton, Raynham, Taunton, and West Bridgewater (Figures 4.14-5c-d). The ACEC is fragmented by several major transportation corridors, including Routes 24, I-495, 138, 106, and other major roadways, and it includes substantial upland areas within the watershed of the Hockomock Swamp. These uplands include land developed in commercial and residential uses as well as undeveloped forested upland and farmland.

Much of the Hockomock Swamp portion of the ACEC (approximately 5,000 acres) is owned by the Massachusetts Division of Fisheries and Wildlife as the Hockomock Swamp Wildlife Management Area (WMA). The DCR describes the ACEC is one of the most extensive inland wildlife habitats in southeastern

Massachusetts and as the largest vegetated freshwater wetland system in Massachusetts. The wetland system includes Hockomock Swamp, Dead Swamp, Titicut Swamp, and Little Cedar Swamp.[19]

The ACEC provides habitat for at least 13 species listed as rare, endangered, or of special concern by the NHESP, and contains several different plant communities. The Atlantic white cedar swamp and fen wetland communities scattered throughout the ACEC are considered to be outstanding examples of these unique natural communities. The Atlantic white cedar community is found on the western side of the embankment. Because the railroad berm controls the flow of water from west to east, higher surface water elevations are maintained west of the embankment and are associated with the Atlantic white cedar community. The portion of the wetland east of the railroad berm contains a red maple-dominated wetland. The hydrology of this area is controlled by the Route 138 embankment.

This wetland complex includes two Core Habitats (BM1166 and BM1168). The Stoughton Line crosses the Hockomock Swamp for approximately 1.6 miles and the BioMap Core Habitat (BM1166) for approximately 3 miles (Figures 4.14-5c-d). The Stoughton Line is not adjacent to the Core Habitat (BM1168).

Pine Swamp (BM1196)—Pine Swamp is a 275-acre wetland system located in western Raynham and includes several properties that are owned by the Town of Raynham Conservation Commission (Figure 4.14-5d). This area consists of forested and marsh wetlands, is located within mapped estimated habitat of several rare wetland species, and supports an Atlantic white cedar swamp community. The right-of-way for the Stoughton Alternatives (diesel, electric)) crosses the both the Pine Swamp and Core Habitat (BM1196) for approximately 1 mile between King Phillip Street and East Britannia Street.

Living Waters

The Stoughton Line is adjacent to Living Water Core Habitat (LW080) near a reach of the Taunton River that provides habitat for the federally listed Atlantic sturgeon. The right-of-way crosses this section of the Taunton River for approximately 125 feet, south of Weir Junction in Taunton (Figure 4.14-3a). North of Weir Junction, the Stoughton Alternatives (diesel, electric) cross the Taunton River three more times on a series of bridges located upstream from the area mapped as Living Water (LW080) (Figure 4.14-5e).

Fisheries Habitat

The Stoughton Line crosses Whitman Brook, Queset Brook, Black Brook, Pine Swamp Brook, Taunton River, and the Mill River, which are all important fisheries habitats. Table 4.14-4 includes fisheries survey results for these habitats. According to the Massachusetts Department of Fish and Wildlife comment letter on the DEIS/DEIR, fisheries surveys of the Mill River yielded 10 species, including American eel (*Anguilla rostrata*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), brown bullhead (*Ameiurus nebulosus*), chain pickerel (*Esox niger*), common shiner (*Notropis cornutus*), largemouth bass (*Micropterus salmoides*), pumpkinseed (*Lepomis gibbosus*), redfin pickerel (*Esox americanus americanus*) and tessellated darter (*Etheostoma olmstedi*).

[19] Hockomock Swamp ACEC website: (http://www.mass.gov/dcr/stewardship/acec/acecs/l-hcksmp.htm).

Breeding Bird Diversity along the Stoughton Corridor

In response to requirements of the Secretary's Certificate, as well as other comments received in the DEIS/DEIR, breeding bird surveys and other studies conducted to refine the wildlife impact assessment and mitigation plans. The updated evaluation of breeding bird diversity includes a description of key avian habitats and an updated list of breeding birds (identifying area-sensitive bird species as well as wetland-dependent birds) likely to occur along the Stoughton Alternative.

Key Avian Habitats

Although breeding birds occur along the entire South Coast Rail corridor, several key areas for the protection of bird diversity have been identified by the Massachusetts Audubon Society (Mass Audubon) and the Natural Heritage and Endangered Species Program (NHESP) Biomap program. This section describes these key habitat areas and provides an update of the breeding birds likely to occur in the key avian habitat areas.

An Important Bird Area (IBA) is an area that provides important habitat to one or more species of breeding, wintering, and/or migrating birds. These areas are designated as part of an international effort to protect bird habitat around the world. The Massachusetts Audubon Society has designated two IBAs within the study area: the Hockomock Swamp and the Freetown Fall River State Forest/Southeastern Massachusetts Bioreserve. Other key bird habitats are large, relatively intact forested areas and include Pine Swamp in Raynham, the Assonet Cedar Swamp in Lakeville, and the Acushnet Cedar Swamp in New Bedford.

Hockomock Swamp IBA—The Hockomock Swamp IBA is a 5,126 acre area located in Bridgewater, Easton, Norton, Taunton, West Bridgewater, Bridgewater, and Plymouth. It includes three state owned wildlife management areas (WMA): the Hockomock Wildlife Management Area, the Wilder Wildlife Management Area, and the West Meadows Wildlife Management Area. This IBA provides important migratory/stopover habitat as well as nesting habitat.

The area has been reported to contain nine breeding and/or wintering/migrant state-listed species, and at least 47 regional and five state high conservation priority species. Very abundant species are gray catbird, northern waterthrush, common yellowthroat, swamp sparrow, common grackle, and veeries. State-listed species within this IBA include: grasshopper sparrow, short-eared owl, upland sandpiper, common moorhen, king rail, sharp shinned hawk, northern harrier, least bittern, and pied-billed grebe.

The major habitat types found within this IBA include oak-conifer forest, cultivated grassland, cultivated field, emergent freshwater wetland, palustrine woodland swamp, shrub-scrub wetland, lake/pond, and river/stream.

Freetown Fall River State Forest/ Southeastern Massachusetts Bioreserve IBA—The Freetown Fall River State Forest/Southeastern Massachusetts Bioreserve IBA is a 15,000 acre area located in the towns of Freetown, Fall River, and Bristol. It includes the Freetown Fall River State Forest, the Acushnet Cedar Swamp, and the Southeastern Massachusetts Bioreserve. This area supports important avian habitat diversity, especially in the Rattlesnake Brook area, and provides important migratory/stopover habitat as well as nesting habitat. Because of the Bioreserve designation, there is a focus on habitat management, research, and monitoring of flora and fauna. Some of the bird monitoring efforts include: Christmas Bird Counts, spring migration bird counts, Breeding Bird Surveys, and Biodiversity Day events. Christmas Bird Counts and Breeding Bird Surveys have been conducted since 1970.

The area has been reported to contain one breeding and/or wintering/migrant state listed species, and at least seven regional and one state high conservation priority species. Very abundant species include the Eastern towhee, ovenbird, and prairie warbler. The migrant state listed species reported to use the IBA is the Northern parula.

The major habitat types found within this IBA include northern hardwoods forest, oak-conifer forest, pitch pine/scrub oak, early successional shrubland, power line, shrub-scrub wetland, and river/stream.

Pine Swamp—Pine Swamp is a 275 acre wetland system in western Raynham that includes several properties owned by the Town of Raynham Conservation Commission. This area consists of forested and marsh wetlands, is located within mapped estimated habitat of several rare wetland species, and supports an Atlantic white cedar swamp community. The right-of-way crosses Pine Swamp for approximately 1 mile between King Phillip Street and East Britannia Street.

Assonet Cedar Swamp—As previously discussed as a BioMap Core Habitat, the Assonet Cedar Swamp in Lakeville and Freetown is considered key bird habitat.
Acushnet Cedar Swamp

As previously discussed as a BioMap Core Habitat, the Acushnet Cedar Swamp State Reservation located in New Bedford and Dartmouth, is considered key bird habitat

Breeding Bird Diversity

A list of potential breeding birds along the Stoughton alignment (including the Southern Triangle) was developed using the Mass Audubon Breeding Bird Atlas 2 data. Data for atlas blocks in five areas were reviewed: Hockomock Swamp (Blocks Brockton 09, Taunton 07); Pine Swamp (Taunton 08); Assonet Cedar Swamp (Somerset 11); Freetown-Fall River State Forest (Somerset 09, 12); Acushnet Cedar Swamp (New Bedford North 02). Birds listed as Confirmed, Probable, or Possible breeders were assumed to be potential breeding birds along the Stoughton corridor.

As described above, the breeding bird atlas block lists were used to develop a list of potential breeding bird species for each of the key habitat areas (the Hockomock Swamp, Pine Swamp, the Assonet Swamp, Freetown-Fall River State Forest, and the Acushnet Cedar Swamp). As shown in Table 4.14-1 , there are potentially 101 breeding bird species along the Stoughton Alternative corridor, in the key habitat areas.

Each atlas block is 1/12 of a USGS topographic quad, and covers 10 square miles. The breeding bird data for each block therefore includes substantial areas that are not adjacent to the rail corridor, and includes a range of habitats (suburban neighborhoods, open fields, ponds and lakes, marshes, upland forest, forested swamps). This diversity of habitats is reflected in the list presented in Table 4.14-1, which includes suburban birds (cardinal [*Cardinalis cardinalis*], robin [*Turdus migratorus*], chipping sparrow [*Spizella passerine*], chimney swift [*Chaetura pelagica*]); birds of ponds and lakes (mute swan [*Cygnus olor*], osprey [*Pandion haliaetus*], kingfisher [*Ceryle alcyon*]); birds of marshes (red-winged blackbird [*Agelaius phoeniceus*], marsh wren [*Cistothorus palustris*], yellow warbler [*Dendroica petechial*]), birds of fields and shrublands (bluebird [*Sialia sialis*], savannah sparrow [*Passerculus sandwichensis*], song sparrow [*Melospiza melodia*], indigo bunting [*Passerina cyanea*]); and birds of upland dry forest (whip-poor-will [*Caprimulgis vociferous*], Eastern towhee, pine warbler [*Dendroica pinus*]).

The primary bird species of concern are the forest interior species, birds that require large areas of forest (upland or wetland) for nesting. These include such species as barred owl [*Strix varius*], broad-winged hawk [*Buteo platypterus*], veery [*Catharus fuscescens*], wood thrush [*Hylocichla mustelina*], black-and-white warbler [*Mniotilta varia*], American redstart [*Setophaga ruticilla*], and scarlet tanager [*Piranga olivacea*]. As shown in Table 4.14-1, the Acushnet Cedar Swamp area has the highest number (16) of these forest interior birds, while the other areas are similar in the level of diversity of forest interior birds, with 9 to 11 species reported in each area.

There are 18 wetland-dependent bird species reported from these key habitat areas. These species occupy a wide range of breeding habitats, including open water (osprey, great blue heron [*Ardea Herodias*], mute swan), marshes (red-winged blackbirds), and shrub swamps (common yellowthroat, swamp sparrow). None are restricted to forested wetlands. As shown in Table 4.14-1, the majority of the wetland-dependent species occur in all of the key habitat areas.

Vernal Pools

In 2000-2001, the South Coast Rail right-of-way for the Stoughton Alternative was delineated for wetlands and investigated for the presence of vernal pool habitat. During these investigations, 16 certified vernal pools and 14 uncertified vernal pools were identified adjacent to the Stoughton Line and documented in the 2002 Final EIR. Some of the vernal pool point data available from GIS were found to be incorrectly located when compared to field verified locations.

Previous vernal pool surveys were supplemented by additional surveys conducted in 2008 and 2009. The 2008 investigations included surveys of the right-of-way in Stoughton, Easton, and Raynham along the inactive Stoughton Main Line. Three previously unidentified vernal pools were observed and documented adjacent to the right-of-way in Easton and Raynham (VP-10, VP-11, and VP-12). The 2009 investigations included surveys of the right-of-way in Stoughton, Taunton, Easton, and Raynham along the inactive Stoughton Main Line and Whittenton Branch. Three additional vernal pools were identified and documented adjacent to the right-of-way in Easton and Raynham (VP-13, PVP-23791, and PVP-25089). These vernal pools were mapped using GPS technology and are described below.

On April 7, 2009 additional vernal pools inspections were conducted along the Stoughton Line in Easton and Raynham in conjunction with NHESP staff. During this field visit NHESP inspected certified, potential, and previously-unidentified vernal pools found between Depot Street and Bridge Street (Hockomock Swamp). The following is a summary of this effort:

Approximately three new vernal pools, illustrated in Figures 4.14-7c-d as NHESP-1, NHESP-2, and NHESP-3, were identified with sufficient evidence of obligate species (wood frogs, spotted salamanders, and fairy shrimp) to allow certification.

Three previously identified potential vernal pools (PVP-7256, PVP-7257, and PVP-20158) had sufficient evidence of obligate species to allow certification. All certified vernal pools had evidence of obligate species.

In 2010, field work began in order to identify and delineate all wetland resource areas along the Stoughton Alternative. At that time, any additional vernal pools not found during earlier surveys were identified. Visual searches were conducted along the right-of-way to identify any previously unidentified vernal pools. Several NHESP identified potential vernal pools within 100 feet of the right-of-way were inspected for the presence of certification characteristics under NHESP guidance. Previously unidentified

vernal pools were located and documented. Some of the vernal pool point data available from MassGIS were found to be incorrectly located when compared to field verified locations and certification forms provided by the NHESP. The locations of all certified, potential, and field verified vernal pool are shown in Figures 4.14-7-10.

The Secretary's Certificate required a more expansive level of vernal pool assessment, including indirect impacts to upland habitat for vernal pools up to 750 feet on either side of the right-of-way. It is not practicable to conduct complete searches of the entire area within 750 feet from the right-of-way, due to the large area which would require review (approximately 15 square miles) as well as the fact that the vast majority of the land is under private ownership. However, all known certified and potential vernal pools within 750 feet of the right-of way were used in the impact analysis.

Existing Vernal Pools along the Stoughton Alternative inclusive of the Southern Triangle—Numerous vernal pools are present within the right-of-way and in other locations within the study area. Several vernal pools occur adjacent to the railroad embankment. There are clusters of vernal pools in several locations that may have higher wildlife habitat value than single, isolated pools. Table 4.14-5 summarizes the vernal pools that have at least some portion inside the right-of-way, pools within 100 feet of the right-of-way, and pools within 750 feet of the right-of-way.

The Stoughton Alternative passes through four large vernal pool complexes, consisting mostly of PVPs. Vernal pools are present on both sides of the right-of-way in Easton, immediately south of the proposed North Easton Station site (Figure 4.14-7b). Movement of vernal pool amphibians between pools in this area may occur to some degree, but this movement is likely to be constrained by the presence of the existing, abandoned tracks (rails) in this area. A large vernal pool complex is present within Hockomock Swamp in Easton, south of Foundry Street, extending to the powerline corridor (Figure 4.14-7c). Several discrete vernal pools are present south of the powerline corridor. Large areas of the Hockomock Swamp support breeding of vernal pool amphibians and spotted turtles although they do not meet the regulatory definition of vernal pools. Movement between these areas is currently unrestricted. These sections of the out-of-service right-of-way are heavily used by All Terrain Vehicles (ATVs), which drive through the vernal pools in serpentine and circuitous routes and adversely affect the habitat of vernal pool fauna, particularly during breeding, egg and larval stages. A group of PVPs is mapped within the Hockomock Swamp ACEC in Raynham, north of Bridge Street (Figure 4.14-7d). The right-of-way in this area is open and unvegetated, but does not have tracks or ties. Vernal pool complexes are also present along both sides of the right-of-way south of Pine Swamp in Raynham between East Brittania Street and Thrasher Street, and between Thrasher Street and Winter Street (Figure 4.14-7e).

The New Bedford Main Line and Fall River Secondary pass by relatively few vernal pools, and the pools along these lines do not form clusters. Connectivity between these pools is often already fragmented by existing roads.

Table 4.14-5 Summary of Vernal Pools Inclusive of the Southern Triangle

Municipality	Pools within ROW	Field Verified Pools within 100 of ROW (additional)	Mapped Certified and Potential Pools within 750 feet of ROW (additional)
Canton	0	0	1
Stoughton	1	2	2
Easton	11	20	14
Raynham	6	4	17
Taunton	5	7	22
Berkley	0	4	8
Lakeville	0	1	2
Freetown	4	3	7
New Bedford	0	1	6
Fall River	0	0	0
Total	27	42	78

Fish and Wildlife Passage

A detailed inventory of bridges and culverts was conducted to identify the location, condition, and function of each structure. Dimensions, construction materials, and railroad bed characteristics (such as condition and depth of cover) were recorded. For this biodiversity assessment, the subset of bridges and culverts with potential ecological value was determined by reviewing wetland mapping (as depicted in the Abbreviated Notice of Resource Area Determination [ANRAD] for each municipality), surrounding land use (as visible in aerial photographs), and other ecological setting features, as modeled by the University of Massachusetts' Conservation Assessment and Prioritization System CAPS, of the complete bridge and culvert inventory. The CAPS model background information is provided in Section 4.14.3.1 Impact Assessment Methodology. The inventory of this subset of bridges and culverts is provided in Appendix 4.14-A, and summarized in this section.

There are 128 structures (23 bridges and 105 culverts) along the Stoughton Alternative alignment (comprised of the Stoughton Line, New Bedford Main Line, and Fall River Secondary) that may have biodiversity value by connecting ecosystems, which can allow fish and wildlife to pass from one side of the tracks to the other. Many of these structures also have a hydrologic function, allowing water to flow under or through the railroad structure (subgrade, ballast, ties, and tracks). Bridges that convey roads under or over the railroad bed would also be improved for the project but do not have an ecological function connecting ecosystems and are therefore not included in this biodiversity evaluation. Bridges and culverts that have been replaced prior to the South Coast Rail project are also not included in this biodiversity evaluation, as are 29 culverts within the right-of-way that do not cross under the railroad bed (are parallel to it) and therefore do not connect ecosystems bisected by the railroad.

The distribution of these existing 128 structures with potential ecological value between the three rail segments is indicated in Table 4.14-6. A detailed inventory of the structures is provided in Appendix 4.14-A. Figures 4.14-11 through 4.14-13 depict existing bridge and culvert locations.

Table 4.14-6 Summary of Bridges and Culverts

Structure	Stoughton Line	New Bedford Main Line	Fall River Secondary	Total
Bridges	10	6	7	23
Culverts	50	28	27	105
Total	60	34	34	128

Portions of the three railroad lines were originally constructed in the mid-1800s and many of the culverts may date from that period. The current major bridges, such as those over the Taunton River in Taunton, were constructed in the early 1900s.[20] Many of these structures would be replaced to meet modern engineering standards.

The bridges along the Stoughton Alternative are open-bottom structures with abutments or pilings supporting a deck stringer, girder, slab, or trestle to which the tracks are affixed. Most of the bridges considered in this biodiversity evaluation convey the tracks over perennial streams, rivers, or ponds and therefore allow unimpeded passage of aquatic species (fish and amphibians). These over-water bridges generally accommodate flood flow. Some bridges are located in upland areas and may have originally conveyed the tracks over farm roads, and can now serve as open passage for wildlife on the abandoned roads; a subset of these bridges are located along the Taunton River in Fall River and also allow flood access to land subject to coastal storm flowage (LSCSF), as shown in Table 4.14-7. The majority of the bridges range in length from 12 to 36 feet; the longest bridges are the four over the Taunton River in Taunton (Figure 4.14-11e), ranging from 113 to 176 feet long, on the Stoughton Line. Another substantial bridge, 64 feet long, crosses the Cedar Swamp River in Freetown (Figure 4.14-12b) on the Fall River Secondary. Construction features of each bridge are provided in the culverts along the Stoughton Alternative are open- or closed-bottom box or pipe structures beneath the tracks, covered with a layer of railroad bed ballast. Most of the culverts along the alignment are stone boxes; others are cast iron pipe, ductile iron pipe, corrugated metal pipe, or other materials. The culverts considered in this biodiversity evaluation provide a variety of hydrologic functions, as indicated in Table 4.14-8 and Appendix 4.14-A.

Culverts providing upland drainage accommodate stormwater flow but are otherwise dry. Wetland equalization functions maintain surface water levels in adjoining wetlands. Intermittent or perennial streams are conveyed by some culverts, while others connect parts of a pond bisected by the railroad.

Some of the culverts along the alignment are collapsed, buried, or washed out and no longer perform their original hydrologic function or any ecological function. Others are submerged, either continuously or seasonally, and may no longer perform their original hydrologic function but currently allow water flow and fish or amphibian passage. At some culvert locations, the railroad bed has dammed surface water flow, creating a pond or wetland on the upstream side, especially where the culvert has collapsed. Culverts at these locations maintain water levels in the upstream pond or wetland.

[20] A number of bridges over or under roadways were replaced within the last 15 years.

Table 4.14-7 Bridge Features

Bridge	Figure Number	Crosses	Type	Number of Spans	Length (feet)
Stoughton Line					
Forge Pond	4.14-11a	Perennial Pond	Stone arch	1	29
Mill Brook (Beaver Meadow Brook)	4.14-11a	Perennial Stream	Through girder	1	18
Cowessett Brook (Whitman Brook)	4.14-11b	Perennial Stream	Deck stringer	1	20
Quesett Brook (Small Creek)	4.14-11b	Perennial Stream	Deck stringer	1	15
Pine Swamp Brook #1	4.14-11d	Perennial Stream	Unknown	1	15
Pine Swamp Brook #2	4.14-11d	Perennial Stream	Unknown	1	12
Taunton River (at MP 34.38)	4.14-11e	Perennial River	Deck girder	11	118
Taunton River (at MP 34.62)	4.14-11e	Perennial River	Deck girder	16	172
Taunton River (at MP 34.73)	4.14-11e	Perennial River	Deck stringer	17	176
Mill River	4.14-11e	Perennial River	Deck girder	1	37
New Bedford Main Line					
Taunton River (at MP 35.56)	4.14-11e	Perennial River	Through girder	4	113
Brickyard Road	4.14-11e	Upland	Deck stringer	1	20
Cotley River (at MP 38.93)	4.14-12a	Perennial River	Deck girder	1	20
Cotley River (at MP 39.46)	4.14-12a	Perennial River	Deck girder	1	21
Cedar Swamp River	4.14-12b	Perennial River	Timber pile trestle	2	21
Fall Brook	4.14-12b	Perennial Stream	Deck stringer	1	17
Fall River Secondary					
Cedar Swamp River	4.14-13a	Perennial River	Deck stringer	3	64
Farm Road	4.14-13b	Upland	Deck stringer	1	18
Farm Road	4.14-13b	Upland	Deck stringer	1	17
Miller’s Cove Road	4.14-13b	Upland/ LSCSF	Concrete slab	1	15
Collins Road	4.14-13b	Upland/LSCSF	Through girder	1	35
Ashley’s Underpass	4.14-13b	Upland/LSCSF	Timber stringer	1	23
Channel near Battleship Cove	4.14-13c	Perennial Stream	Unknown	1	Unknown

Table 4.14-8 Culvert Hydrologic Functions

	Hydrologic Function				
Railroad	**Upland Drainage**	**Wetland Equalization**	**Stream Conveyance**	**Pond Connector**	**TOTAL**
Stoughton Line	13	23	14	0	50
New Bedford Main	3	16	9	0	28
Fall River Secondary	8	7	11	1	27
Total	24	46	34	1	105

Other Important Habitat Areas

The Stoughton Line crosses and is adjacent to large wetland and upland areas in Stoughton (adjacent to Stoughton Memorial Conservation Land), and in Easton, between River Terrace and Partridge Way and between Baldwin Street and Prospect Street (Figures 4.14-5b-c). These wetlands and wooded upland areas are mostly unfragmented open space that could be important wildlife habitat because they may be used as dispersal, migration, breeding, foraging, and as bird stopover areas.

Stoughton Memorial Conservation Land—The Town of Stoughton's Memorial Conservation Land (which includes the Bird Street Conservation Lands) is a 675-acre parcel west of the Stoughton Line right-of-way, extending from Plain Street to the Easton town line and west of the Bird Street Conservation Area (which is not within 0.5 mile of the corridor). The Stoughton Conservation Memorial Lands represent the largest contiguous conservation area owned by the Town of Stoughton.[21]

The majority of the land is wooded, but it also contains large areas of open fields. The area supports a variety of habitats, including a former quarry, old fields, a pond, marshes, forested wetlands, and forested uplands. The primary access to the property is off Bird Street. The area extends to the MBTA right-of-way in two locations, with approximately 1,500 feet of frontage on the right-of-way (Figure 4.14-5b). One location is a narrow strip where the railroad closely parallels Route 138 south of Morton Street. The second location is south of Totman Farm Road, extending to the Easton town line west of the right-of-way. The majority of the area and all of the developed trail system are more than 1,000 feet from the right-of-way and it does not include any BioMap Core Habitat. This area contains a cluster of potential vernal pools.

Whittenton Alternative

The Whittenton Alternative runs predominantly along the same course as the Stoughton Alternative. The Whittenton Alternative is different from the Stoughton Alternative only along a portion of right-of-way between Raynham Junction and Weir Junction, a length of approximately 5.8 miles. A section of the Whittenton Alternative, known as the Whittenton Branch, diverges from the Stoughton Line at Raynham Junction and travels through Raynham and Taunton for approximately 3.4 miles to Whittenton Junction. This section of track is currently inactive. At Whittenton Junction, the track joins the Attleboro Secondary, an active rail line, for approximately 2.4 miles to Weir Junction at the beginning of the New Bedford Main Line. The Whittenton and Stoughton Alternatives run the same course on the Stoughton Line from Canton to Raynham Junction. The New Bedford Main Line and the Fall River Secondary are

[21] Town of Stoughton Open Space and Recreation Plan, prepared by Horsley Witten Group, public review draft April 2006, p. 38.

also identical for both alternatives. Figures 4.14-6 and 4.14-10 show the Whittenton Branch and Attleboro Secondary segments of the Whittenton Alternative.

The right-of-way corridor in Raynham is approximately 1.2 miles long and is characterized by a wide, well-worn path used by ATVs, horses, mountain and motor bikes, and pedestrians. A power line runs down the eastern edge of the right-of-way from Raynham Junction to King Philip Street, creating a canopy gap at least 20 feet wide in most places. Although the western side of the right-of-way passes by a large wetland area (Wetland RWB 02), the majority of the eastern side of the right-of-way from Raynham Junction to King Philip Street is characterized by residential development. From south of King Philip Street to the municipal border between Raynham and Taunton, the right-of-way passes through a highly disturbed area, currently the site of a construction and demolition (C&D) debris disposal facility that has encroached onto the railroad right-of-way. New England Recycling, Inc. of Taunton stores the C&D debris at the Raynham Facility, which abuts the railroad right-of-way and has an address of 138 (Rear) Broadway in Raynham. Disposal of C&D debris on the railroad right-of-way is not an authorized use of the land. The right-of-way is currently occupied by what appears to be material containing stumps, compost, sand, gravel, boulders, and minor amounts of solid waste and debris. The disposal facility operator has indicated that this material is frequently relocated and new material brought into the site and would be relocated at the request of MassDOT.

For these reasons, biodiversity issues are fairly limited in scope along the Raynham section of the Whittenton Branch. Because of the canopy gap and the development on the eastern side of the right-of-way, no large areas of wetland or upland habitat would be fragmented by the railroad. No endangered species habitat exists along the right-of-way, and no perennial streams are crossed.

The Taunton section of the right-of-way is approximately 2.2 miles long. From the municipal border between Raynham and Taunton, the right-of-way passes by Prospect Hill Pond and travels through a wooded upland for approximately 0.6 mile. The path in this section remains wide with a canopy gap, and several side ATV trails branch off from the right-of-way. This section of the right-of-way also passes by a wetland area (Wetland TWB 09) containing Atlantic white cedar, a state listed rare species. The right-of-way then enters another developed area and crosses Bay and Whittenton Streets, passing close by several residential properties to the east as well as an industrial land parcel to the west, for approximately 0.6 mile. South of Whittenton Street, the right-of-way has been widened into an access road which was previously used to access a stone quarry site to the west. The roadway is approximately 20 feet wide. The right-of-way then crosses the Mill River and Warrren Street, a distance of approximately 0.3 mile. South of Warren Street, the right-of-way follows the access road for another 0.3 mile. Finally, the right-of-way branches off from the access road, and for the remaining 0.3 mile, it travels through an area of denser vegetation, with a narrow path approximately 6 to 8 feet wide and a closed canopy in places. The entire 0.6 mile area south of Warren Street has also been designated as eastern box turtle habitat by the Natural Heritage and Endangered Species Program (NHESP). Threatened and endangered species are discussed in detail in Chapter 4.15.

Prospect Hill Pond and the surrounding forested upland provide wildlife habitat, despite nearby ATV use of the area. The Mill River is a perennial stream and provides a wildlife corridor for both fish and birds. Finally, the area south of Warren Street has several large wetland areas adjacent to it that ultimately drain to the Mill River (Wetlands TWB-05.1 through TWB-01).

Biomap Core Habitats

Similar to the Stoughton Alternative the Whittenton Alternative would cross Biomap Core Habitat in two areas. The Hockomock Swamp, from Foundry Street in Easton south to Bridge Street in Raynham, is designated as Core Habitat.

Living Waters

No mapped Living Waters occur along the Whittenton Alternative.

Fisheries Habitat

According to the Massachusetts Department of Fish and Wildlife comment letter on the DEIS/DEIR, fisheries surveys of the Mill River yielded ten species, including American eel, black crappie, bluegill, brown bullhead, chain pickerel, common shiner, largemouth bass, pumpkinseed, redfin pickerel and tessellated darter.

Breeding Bird Diversity

Potential breeding birds along the Whittenton Alternative are similar to Stoughton Alternative (including the Southern Triangle) as detailed above.

Vernal Pools

A total of 17 vernal pools lie within 750 feet of the right-of-way along the Whittenton Branch and Attleboro Secondary (Table 4.14-9). Much of the Attleboro Secondary is in developed areas of Taunton, and no vernal pools are present in these developed areas.

Table 4.14-9 Summary of Vernal Pools–Whittenton Alternative

Municipality	Pools within ROW	Pools within 100 of ROW (additional)	Pools within 750 feet of ROW (additional)
Canton	0	0	1
Stoughton	1	2	2
Easton	11	20	14
Raynham	0	5	11
Taunton	1	8	18
Berkley	0	4	8
Lakeville	0	1	2
Freetown	4	3	7
New Bedford	0	1	6
Fall River	0	0	0
Total	17	43	71

A total of 136 vernal pools lie along or within 750 feet of the right-of-way of the Whittenton Alternative as a whole.

Similar to the Stoughton Alternative, the Whittenton Alternative passes several large vernal pool complexes, consisting mostly of PVPs. Vernal pools are present on both sides of the right-of-way in Easton, immediately south of the proposed North Easton Station site (Figure 4.14-5b). Movement of

vernal pool amphibians between pools in this area may occur to some degree, but this movement is likely to be constrained by the presence of the existing tracks. A large vernal pool complex is present in Easton south of Foundry Street, extending to the powerline corridor (Figure 4.14-5c). Several discrete vernal pools are present south of the powerline corridor. Large areas of the Hockomock Swamp support breeding of vernal pool amphibians and spotted turtles although they do not meet the regulatory definition of vernal pools. Movement between these areas is currently unrestricted. These sections of the out-of-service right-of-way are heavily used by All Terrain Vehicles (ATVs), which drive through the vernal pools and adversely affect the habitat. A group of PVPs is mapped within the Hockomock Swamp ACEC in Raynham, north of Bridge Street (Figure 4.14-5d). The right-of-way in this area is open and unvegetated, but does not have tracks or ties. This alternative avoids potential impacts to vernal pool complexes present along both sides of the right-of-way south of Pine Swamp in Raynham between East Brittania Street and Thrasher Street, and between Thrasher Street and Winter Street (Figure 4.14-5e).

The New Bedford Main Line and Fall River Secondary pass by relatively few vernal pools, and the pools along these lines do not form clusters. Connectivity between these pools is often already fragmented by existing roads.

Fish and Wildlife Crossings

A detailed inventory of bridges and culverts was conducted to identify the location, condition, and function of each structure. Dimensions, construction materials, and railroad bed characteristics were recorded. For this biodiversity assessment, the subset of bridges and culverts with potential ecological value was determined by reviewing wetland mapping, surrounding land use (as visible in aerial photographs), and other ecological setting features (as modeled by CAPS) of the complete bridge and culvert inventory. The CAPS model output indicates areas with a high (over 50 percent) Index of Ecological Integrity (IEI). No areas with a high IEI exist along the Whittenton Branch.

There are eight structures (one bridge and seven culverts) along the Whittenton Branch that may have biodiversity value by connecting ecosystems, which can allow fish and wildlife to pass from one side of the tracks to the other. Most of these structures also have a hydrologic function, allowing water to flow under or through the railroad structure (subgrade, ballast, ties, and tracks). Bridges that convey roads under or over the railroad bed would also be improved for the project but do not have an ecological function connecting ecosystems and are therefore not included in this biodiversity evaluation.

The culverts along the Whittenton Branch are open- or closed-bottom box or pipe structures beneath the tracks, covered with a layer of railroad bed ballast. Most of the culverts along the alignment are stone boxes; one culvert consists of a clay pipe. The culverts considered in this biodiversity evaluation provide a variety of hydrologic functions, as indicated in Table 4.14-10. Culverts providing upland drainage accommodate stormwater flow but are otherwise dry. Wetland equalization functions maintain surface water levels in adjoining wetlands. Intermittent or perennial streams are conveyed by some culverts. Figures 4.14-14a-b depict existing bridge and culvert locations.

Table 4.14-10 Existing Conditions along the Whittenton Branch–Fish and Wildlife Passage

Wetland ID	Municipality	Description	Function
RWB-02.1, RWB-02	Raynham	Stone box culvert under ROW, 4 feet wide by 5 feet high, intermittent stream likely flows east to west	Carries intermittent stream flow
TWB-10, TWB-09	Taunton	Stone box culvert under ROW, 2.5 feet wide by 3 feet high, intermittent stream likely flows east to west	Limited ecological functions – collapsed/sunken at western end
TWB-08, TWB-07	Taunton	Stone box culvert under Whittenton St., 2.5 feet wide by 3 feet high, intermittent stream likely flows north to south	Carries intermittent stream flow
TWB-07, TWB-06	Taunton	Bridge (approx. 50 feet) over Mill River (perennial), flows west to east	Perennial stream flows under bridge
TWB-06, TWB-05.1	Taunton	Stone box culvert under Warren St., 4 feet wide by 3 feet high, intermittent stream flows south to north	Wetland equalizer
TWB-05.1, TWB-05	Taunton	Stone box culvert under ROW, 2 feet wide by 2.5 feet high at west end, 5 feet wide by 2.5 feet high at east end, intermittent stream flows west to east	Wetland equalizer
TWB-05, TWB-04	Taunton	Stone box culvert under ROW, 3.5 feet wide by 2 feet high at west end, 2 feet wide by 1.5 feet high at east end, intermittent stream flows east to west	Wetland equalizer
TWB-02, TWB-01	Taunton	12-inch diameter clay pipe culvert under ROW, intermittent stream likely flows east to west	Wetland equalizer
TOTAL CROSSINGS: 8			

Other Important Habitat Areas

The Whittenton Branch (Whittenton Alternative), crosses and is adjacent to large wetland and upland areas in Raynham between Route 138 and King Philip Street, and in Taunton adjacent to Prospect Hill Pond, and between Meadow Street and Whittenton Junction (Figure 4.14-6a). These wetlands and wooded upland areas are mostly unfragmented open space that could be important wildlife habitat because they may be used for dispersal, migration, breeding, foraging, and as bird stopover areas.

Stations

This section describes the areas of important biodiversity value within the proposed station sites. None of the proposed station sites are within mapped areas of BioMap Core Habitat, areas of important biodiversity value, or within large areas of undeveloped land. All of the proposed station sites are within fully or partially developed areas.

The station sites that are within fully developed areas and do not contain potential habitat include:

King's Highway—The station would be located in northern New Bedford south of King's Highway, immediately east of Route 140. This station would occupy part of a site that is an existing shopping plaza.

Whale's Tooth—The station would be located on Acushnet Avenue at the existing Whale's Tooth parking lot, which was constructed by the City of New Bedford in anticipation of the commuter rail project.

Fall River Depot—The station would be located 1 mile north of downtown Fall River at Route 79 and Davol Street at the site of the former train station.

Battleship Cove—The station would be located behind the Ponta Delgada monument along Water Street in Fall River. The City of Fall River constructed the Ponta Delgada monument, which includes a pick-up/drop off loop road, in anticipation that this site would be utilized as a commuter rail station.

Easton Village—This station would be located immediately south of the historic H.H. Richardson train station along Sullivan Street in Easton. The existing Historical Society building contains a small parking facility that would be partially reconfigured for pick-up/drop-off traffic flow through the lot.

Raynham Park—The station would be located adjacent to the former Raynham-Taunton Greyhound Park off of Route 138, which is currently operated as a simulcast betting location.

Dana Street (Whittenton Alternative only)—The Dana Street Station would be located just south of the Danforth Street grade crossing, within walking distance of downtown Taunton. The site is a currently vacant lot.

Taunton (Stoughton Alternative only)—The Taunton Station would be located along Arlington Street near Dean Street (Route 44), adjacent to the historic Old Colony train station. The City of Taunton has begun the process of remediating this brownfield site in anticipation of a future train station.

Canton Center—Canton Center Station is an existing station site off of Washington Street that would be modified to accommodate a second track. Two new 800 foot long low-level platforms with mini-high platforms would be constructed (one adjacent to each track). Modifications to the tracks and platforms would require minor changes to the parking layout in the existing lots near the station

Stoughton—The existing Stoughton Station would be relocated to accommodate a second track. The station would be shifted from its present location between Porter and Wyman streets to a new location south of the Wyman Street at-grade crossing. Two new 800 foot long, full-length high-level platforms would be constructed (one adjacent to each track).

With a focus on potential biodiversity, the following sections describe the proposed station sites that are within partially undeveloped areas and may require construction in naturally vegetated areas.

Freetown—The Freetown station site is located on South Main Street and would serve all of the rail alternatives. The approximately 18-acre site is currently in industrial use and is partially occupied by a self-storage facility. The area adjacent to the proposed site is mainly forested and undeveloped and contains areas of wetland habitat. The site is near the western end of the Freetown-Fall River State Forest/Bioreserve. There are additional industrial parcels located north and south of the site. The potential of the site to support biodiversity is limited because it is surrounded by developed areas. No certified or potential vernal pools have been identified near the site (Figure 4.14-4b).

North Easton—The North Easton station site is located at the rear of the Roche Brothers plaza and would serve the Stoughton and Whittenton Alternatives. The proposed site is located just off Route 138 in Easton and would be within the undeveloped portion of the commercial parcel. This portion of the site contains areas of wetland habitat and is near a cluster of certified and potential vernal pools. Land uses on adjacent parcels are commercial, residential, and agricultural. The potential of the site to

support biodiversity is limited because, although open space is located across the tracks, the remainder of the surrounding area is developed (Figure 4.14-5b).

Taunton Depot—The Taunton Depot station site is located at the rear of Target Plaza and would serve the Stoughton and Whittenton Alternatives. The proposed site is currently undeveloped and contains areas of wetland habitat. Adjacent land uses include commercial and residential parcels immediately east and west of the site. The potential of the site to support biodiversity is limited because it is currently surrounded by developed areas. A large wetland complex and two potential vernal pools that have been identified near the station site (Figure 4.14-3a).

Layover Facilities

None of the proposed layover facilities are located within a Priority or Estimated Habitat polygon (see Figures 4.14-3e and 4.14-4b).

4.14.2.3 Summary of Existing Conditions

The study area is the portion of the South Coast region that is adjacent to or crossed by the Build Alternatives. The study area is within the ecoregion called “Bristol Lowland/Narragansett Lowland,” which is defined as a region that has flat gently rolling plains, the forests are mostly central hardwoods, and there are numerous wetlands, cranberry bogs, and rivers that drain this area.[22]

Within the study area, there are several areas of important biodiversity value that are mapped by NHESP as Core Habitat. These include:

- Assonet Cedar Swamp (adjacent to and crossed by the New Bedford Main Line)
- Acushnet Cedar Swamp (adjacent to the New Bedford Main Line)
- Freetown-Fall River State Forest /Southeastern Massachusetts Bioreserve (adjacent to the Fall River Secondary)
- Forge Pond (adjacent to and crossed on a bridge by the Fall River Secondary)
- Hockomock Swamp ACEC (crossed by the Stoughton Alternative)
- Pine Swamp (crossed by the Stoughton Line (Electric and Diesel)

The New Bedford Main Line and Stoughton Line are adjacent to Living Waters Core Habitats. All the alternatives cross important fisheries habitat. Except for the Fall River Secondary, all segments of the alternatives cross and/or are adjacent to large wetlands and/or wooded upland areas. In some instances, these areas include public or privately owned lands under conservation management. These adjacent unfragmented open space areas could be important wildlife habitat because they may be used for wildlife dispersal, migration, breeding, foraging, and as bird stopover areas.

[22] U.S. Environmental Protection Agency (EPA),Ecoregions of Massachusetts, Connecticut, and Rhode Island. Website accessed January 2009. (http://www.epa.gov/wed/pages/ecoregions/mactri_eco.htm).

There are no proposed station sites within BioMap Core Habitat, areas of important biodiversity value, or within large undeveloped areas. All the proposed station sites are within partially or entirely developed areas.

Both of the proposed layover sites (Weaver's Cove East, Wamsutta) have been previously developed for industrial and other uses but have pockets of undeveloped land with limited potential to support biodiversity, depending on site conditions.

Both certified and potential vernal pools are found adjacent to each rail alternative. Several clusters of vernal pools are mapped in the vicinity of each rail alternative. The largest numbers of these occur along the Stoughton Alternative routes.

Table 4.14-11 provides a summary of existing conditions and compares the different alternatives.

Table 4.14-11 Summary of Biological Resources Adjacent to Project Alternatives

Project Alternative (segments)	BioMap Core Habitat	Living Water	Vernal Pools[1]	Important Fisheries Habitat (named Rivers/ streams)[2]	Location
Stoughton Alternative Stoughton Line (Electric and Diesel) Including Southern Triangle	5	2	252	7 (Beaver Brook, Whitman Brook, Queset Brook, Black Brook, Pine Swamp Brook, Taunton River Mill River)	Hockomock Swamp ACEC/ Hockomock Swamp WMA, Pine Swamp, Stoughton Memorial Conservation Land, and other areas of unfragmented habitat.
Whittenton Alternative Stoughton Line (Electric and Diesel) Including Southern Triangle	5	2	203	7 (Beaver Brook, Whitman Brook, Queset Brook, Black Brook, Pine Swamp Brook, Taunton River Mill River)	Hockomock Swamp ACEC/ Hockomock Swamp WMA, Pine Swamp, Stoughton Memorial Conservation Land, and other areas of unfragmented habitat. Tributary to Mill River, Prospect Hill Pond and other areas of unfragmented habitat.

1 Vernal pool numbers were calculated based on MassGIS data for vernal pools found within 750 feet of the right-of-way; and includes certified, potential and other field verified vernal pools

2 Important Fisheries Habitat data streams provided by NHESP in the ENF comment letter dated January 9, 2009.

4.14.3 Analysis of Impacts and Mitigation

4.14.3.1 Impact Assessment Methodology

The proposed South Coast Rail alternatives and associated stations are expected to have direct and indirect effects on natural communities and populations of fish, wildlife and plants. This section discusses direct and indirect effects in general, and describes the methodology used to calculate and evaluate impacts to biodiversity within the project study area. The Secretary's Certificate on the ENF identified the need for (1) an evaluation of direct and indirect environmental impacts on wildlife and their habitats including but not limited to: hydrological changes; fragmentation of habitat and populations; edge effects; noise and vibration; and restrictions to wildlife mobility, and (2) an evaluation

of impacts to migratory birds and their habitats, including Important Bird Areas and Blue Heron nesting sites.

Method for Assessing Direct Impacts

Direct impacts of the alternatives would result from constructing the rail, or station elements. For the rail elements that include active freight railroad, construction includes removing vegetation, grading to widen or adjust the profile of the rail, removing and replacing ballast, track and ties, replacing culverts, and restoring bridges. Both rail alternatives utilize active freight lines with ballasted right-of-way, tracks, and ties. There are culverts that convey streams underneath the embankment. The existing culverts under the berm maintain wetland hydrology and provide crossing points for migratory wildlife to access wetland areas on either side of the embankment. The right-of-way itself does not provide suitable habitat wildlife and the tracks and ties prevent turtles, amphibians, and small mammals from moving across the right-of-way except through the culverts.

Station construction would include clearing vegetation, grading, and paving. In both cases, impacts to biodiversity would occur along the edges of natural habitats and would largely be limited to the loss of narrow strips of habitat along existing edges and would not result in fragmentation.

Constructing railroad infrastructure along abandoned railroad corridors could result in different types of direct or indirect impacts. This construction could result in more substantial loss of habitat, fragment large habitat blocks, and create barriers to animal movement, particularly where old rails have been removed and thus no such barriers currently exist.

The direct effects of these actions include the loss of wildlife habitat and plant communities. Actual habitat loss is a direct effect of transportation projects. Habitat loss occurs if an area that previously provided food, cover, water, and/or breeding resources to a species is cleared, paved, filled or altered in such a way that it no longer provides one or more of these resources. These effects were quantified by overlaying the limit of work for each alternative onto the vegetation cover type mapping provided by MassGIS and described in Section 4.14.2.

Direct effects to vernal pools, a specific category of wildlife habitat that receives special attention under wetland protection regulations, were quantified as the loss of wetland containing a vernal pool. Amphibians that breed in vernal pools use upland forested areas as non-breeding habitat. Therefore, consistent with USACE policy,[23,24] the loss of upland forest within 750 feet of a vernal pool was also quantified as the loss of upland habitat for these organisms. To provide a context for evaluating the numerical loss of upland habitat, the area lost was calculated as a percentage of the total upland area within 750 feet of the affected vernal pools.

Areas within permanent alteration limits that are previously disturbed, such as ballasted railbed and roads, were not counted as habitat loss. In addition, impact areas less than 10 feet wide were not counted as habitat loss.

[23] U.S. Army Corps of Engineers, New England District. 2010. Department of the Army General Permit: Commonwealth of Massachusetts. USAED, New England, Concord, MA.

[24] Massachusetts Division of Fisheries and Wildlife. 2009. Natural Heritage and Endangered Species Program's Guidelines for the Certification of Vernal Pool Habitat. MA Div. Fish. & Wildlife, Westborough, MA.

Types of Indirect Impacts

Indirect impacts are defined as the consequences of an action's direct impacts. These are generally not quantifiable, and may occur over a larger area or over a longer time than the direct impacts. Indirect effects change the quality or functions of a resource. They are measured qualitatively and, therefore, are more difficult to accurately assess than direct effects. Indirect effects will generally be described qualitatively for each of the alternatives.

Indirect effects may include habitat fragmentation and associated edge effects; the loss of genetic diversity of plant and animal populations; increased competition for resource, and physical or psychological restrictions on movements caused by some feature within a corridor that wildlife are unwilling or unable to cross. Short-term temporary indirect effects can be caused by the increased noise and visual disturbance from land-clearing, earth-moving, and construction machinery during construction. Following construction, noise associated with an active rail line may cause indirect effects if noise levels are of sufficient magnitude that wildlife avoid habitat near the facility.

Fragmentation is defined as the subdivision of once large and continuous tracts of habitat into smaller patches. It results from agriculture, urbanization, and transportation or other rights-of-way).[25] Habitat fragmentation is associated with 'edge effects' when there is a disturbed or developed area created adjacent to a natural and/or forested area. Edge effects may include the spread of invasive species, increase in the canopy gap and a decrease in species dependent on core and/or undisturbed habitat. In general, fragmentation of habitat is viewed as detrimental when considering original native, climax species composition and abundance, natural history, and relative ecological stability of unmanaged plant and animal populations. In particular, habitat fragmentation increases the amount of edge relative to the amount of interior habitat.[26] Scientific experts agree that preservation of continuous forest blocks is essential to the long-term protection of biodiversity. However, there is considerable controversy among the scientific community as to what are the critical dimensions of 'unfragmented' forests needed to sufficiently protect wildlife habitat and biodiversity.

A railroad may act as a barrier that interferes with the movement of some mammals, amphibians, birds and reptiles from one habitat to another. The width of a railroad corridor can influence the frequency of wildlife crossings, as well as the mortality associated with potential collisions with rail or vehicular traffic. The rail itself on which the tracks are laid can create a barrier to smaller species such as amphibians, reptiles, and smaller mammals. Traffic density and traffic speed may also influence wildlife avoidance of transportation corridors. [27, 28, 29,30]

A potential indirect effect is the introduction of non-native invasive plant species along the linear corridors of disturbed land.

[25] Rosenfield,R.N., C.M. Morasky,. J. Bielefeldt, and W.L. Loope. 1992. Forest fragmentation and island biogeography: a summary and bibliography. U.S. Department of the Interior Technical Report NPS/NRUW/NRTR 92/08.

[26] Primack, R.B. 2008. A Primer of Conservation Biology, 4th Ed. Sinauer Associates, Sunderland, MA, 349 pp.

[27] Reijnen, R. R. Foppen, C. ter Braak, and J. Thissen. 1995. The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads. Journal of Applied Ecology. 32: 187-202.

[28] Reijnen, R., R. Foppen, and H. Meeuwsen. 1996. The effects of traffic on the density of breeding birds in Dutch agricultural grasslands. Biological Conservation. 75: 255-260.

[29] Reijnen, R. 1995. Disturbance by car traffic as a threat to breeding birds in The Netherlands. PhD thesis, DLO Institute of Forestry and Natural Resources. Wageningen, Netherlands.

[30] Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecological Systems. 29:207-31.

Impacts on Vegetation Community Composition Due to Changes in Physical Parameters of Light and Temperature

Removal of the forest canopy on the existing or proposed railbed could potentially alter the physical conditions (light, wind, temperature) in adjacent forested areas. No adverse effects are anticipated to herbaceous or shrub-dominated communities, since there would be no change in the light, wind or temperature regimes. The canopy gap for the rail alternatives would vary with the width of the limit of work and adjacent land uses. In locations where single track sections are proposed (much of the Southern Triangle, sections of the Stoughton Line and along the Whittenton Branch), the canopy gap would vary between approximately 40 to 80 feet wide. In locations where double track sections are proposed, the canopy gap would vary between 60 to 100 feet wide. Because the project corridors are predominantly oriented along a north-south axis, the resulting forest edges will primarily face east and west.

A review of the relevant scientific literature indicates that incident radiation (direct sunlight) within the understory is a primary factor in determining microclimate in forest ecosystems. Incident radiation within a forest ecosystem is a function of the density of tree canopy and the cumulative amount of projected leaf area. Increases in ambient light levels have been correlated with higher near-ground temperatures, higher vapor pressure deficit and drying of leaf litter.

Recent field studies investigating the edge effects generated by clearcuts have attempted to quantify the increase in light intensity within forests. One study[31] examined forest edge sites in eastern deciduous forests and found strong edge effects associated with increases in light intensity in south, east and west facing forest edges. No statistically significant light intensity edge effects were observed in north facing cuts. Edge effects observed included increases in ambient temperature and vapor pressure deficit and decreases in soil and litter moisture.

The increased light zone extended from 33 feet (10 meters) in east and west facing cuts and up to 115 feet (35 meters) in south facing cuts. These distances are greater than previously published estimates for northern temperate forests. The study examined forest edges associated with wide clearcuts such as fields. Where the proposed rail will require the clearing of a corridor through a forested area, the potential increase in ambient light levels in the understory canopy will be reduced by the shape and orientation of the clearing. The relatively narrow canopy gap and its north-south orientation will limit the potential increase in ambient light within the understory area. Accordingly, the impacts associated with the clearing are considerably less than would be expected in most clear cut/forest edge conditions and would be more similar to a north-facing exposed cut. The study found no significant edge microclimate effects in northern facing cuts. The impact analysis conservatively assumes that increased light, wind and temperature are likely to occur within 30 feet of the cleared edge of the right-of-way, based on the research cited above. The most likely potential effect of this physical change would be to increase the growth rates of the shrubs currently growing in this zone, resulting in a denser shrub layer along the edge. Increased drying of the leaf litter, if this effect occurred, may affect recruitment of shrub and herbaceous species by affecting seed germination and seedling establishment. The anticipated effect would be that the existing sweet pepperbush (*Clethra alnifolia*) and greenbrier (*Smilax rotundifolia*) currently found along the edges of the railbed in wetland areas would respond with enhanced growth and fill the edge gap. These species have responded in this way to increased light

[31] Matlack GR. 1993. Microenvironment variation within and among deciduous forest edge sites in the eastern United States. *Biological Conservation* 66: 185–194.

along the edges of the Hockomock Swamp created by Route 138, and in the Assonet Cedar Swamp along the edges of the New Bedford Main Line.

The temporary nature of the alteration reduces the potential impacts associated with the proposed corridor clearing. An increase in sunlight adjacent to the rail corridor will result in an increase in adventitious limb growth and increased development of the shrub layer. “Closed edges” as defined by Matlack are edges of older clear-cuts where adventitious limbs and shrub growth have closed or partially closed the gaps created by clear-cuts. Once this gap in the canopy is closed, measurable differences in light, temperature, humidity, vapor pressure density and soil moisture are no longer observed.

Impacts to Aquatic Communities Due to Discharge of Pollutants or Change in Light/Temperature Regimes

The rail alternatives are not anticipated to generate non-point source discharges of pollutants to surface waters, and therefore are not considered to have an adverse impact on aquatic communities. A complete discussion of water quality issues is presented in Chapter 4.17, *Water Resources*.

Indirect impacts may occur from the reduction in tree canopy over waterbodies. By reducing canopy cover, surface waters may exhibit changes in light and temperature regimes which have the potential to increase the water body’s algal or macrophyte growth, thereby affecting trophic status. However, based upon the existing canopy coverage and trophic status of these areas, impacts are anticipated to be negligible.

Impacts to Community Structure or Composition Due to Changes in Hydrology

The construction of the existing rail lines altered the hydrology of existing wetlands, and the existing rail and roadway embankments and culverts currently play an important role in the hydrology of adjacent wetlands. Altering the dimensions or elevations of culverts could adversely affect the hydrology of upstream wetlands.

Impacts to Community Composition Due to Introduction of Invasive Species

Construction along any active or inactive rail corridor, or constructing a new rail line, may increase the width of the canopy gap over the railbed and would likely require removing existing vegetation on the elevated railbed. This linear gap, extending through natural communities, which include Atlantic white cedar swamp and red maple swamp, may allow invasive exotic plant species to colonize the railbed or areas adjacent to the railbed. This section examines the invasive species that may potentially be introduced, assesses the likelihood and magnitude of the impacts, and proposes monitoring and mitigation measures.

Invasive species may be defined as “alien species whose introduction does or is likely to cause economic or environmental harm” (Federal Executive Order on Invasive Species).[32] The Massachusetts Invasive Plant Advisory Group (MIPAG) defines invasive plants as “non-native species that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or

[32] Executive Order 13112, 6183 Federal Register 64 (February 8, 1999).

disruptive to those systems.[33] When established in disturbed sites or old fields, these species suppress the natural pattern of plant community succession.

There is a wide range of invasive species known to occur in Massachusetts, occurring in many habitats from ponds and lakes to sand dunes. The primary potential invasive species that could affect wetland edges include:

- *Phragmites australis*, common reed
- *Lythrum salicaria*, purple loosestrife
- *Berberis thunbergii*, Japanese barberry
- *Frangula alnus*, glossy buckthorn
- *Phalaris arundinacea*, reed canary grass
- *Typha angustifolia*; *T. x glauca*, narrow-leaf and hybrid cattail

Other upland species are potential colonizers of the railbed or the forest edges along the railbed, and include:

- *Fallopia japonica*, Japanese knotweed
- *Elaeagnus umbellata*, Autumn olive
- *Celastrus orbiculata*, oriental bittersweet
- *Rosa multiflora*, multiflora rose

Phragmites australis, common reed, is a robust (2 to 5 meters tall) grass believed to be native to North America, but distributed worldwide. The invasive genotype is likely to be a non-native introduction. *Phragmites* spreads by long underground rhizomes that have a very rapid growth rate, and is capable of colonizing large areas and forming monodominant stands that eliminate virtually all native grasses and forbs. Unlike the native species, *Phragmites* provides little wildlife food value, and the tough leaves decompose slowly, which may alter nutrient dynamics of the wetland system. *Phragmites*, although most commonly a species of wetlands, is also found extensively in dry disturbed upland sites such as fill piles, landfills, and gravel areas. *Phragmites* is wind-dispersed. It typically becomes established following disturbance which substantially alters the soil or removes the forest canopy of a wetland, particularly in roadside sites where soil salt contents may be elevated.

Lythrum salicaria, purple loosestrife, is an herbaceous perennial characterized by long showy spikes of magenta flowers. A native of Eurasia, purple loosestrife was introduced into the northeastern US and Canada in the early 1800s. It spreads through wind dispersal of tiny dry seeds (a single stalk may produce as many as 300,000 seeds) and through underground rhizomes. Purple loosestrife may rarely occur in drier wetland-upland transition sites or disturbed uplands such as cultivated fields, but is

[33] Massachusetts Invasive Plant Advisory Group. 2005. The Evaluation of Non-Native Plant Species for Invasiveness in Massachusetts.

typically a plant of wetland wet meadows and marshes. It generally becomes established following disturbance which exposes the soil surface and may remove native species, but may also invade natural undisturbed wetland communities. Once established, it forms monodominant stands which replace the more diverse native community. Purple loosestrife provides little wildlife habitat or food value.

Berberis thunbergii, Japanese barberry, is a thorny shrub with small leaves and attractive bright-red berries. It was introduced into the northeastern U.S. as an ornamental, and continues to be a popular landscaping shrub. It is dispersed by birds. Japanese barberry has become an aggressive invader of forested wetlands south of Massachusetts (Pennsylvania, New Jersey, Connecticut), and is occasionally found in Massachusetts wetlands. Once introduced, it forms a dense nearly monodominant shrub layer less than 1 meter high that eliminates the native shrubs and herbaceous species. This species appears to be able to colonize natural undisturbed wetland communities.

Frangula alnus, glossy buckthorn, is a tall shrub native to Eurasia. It produces small dark berries, and is dispersed by birds. This species typically invades old fields and pastures, and is a major threat to native prairie ecosystems in the Midwest. In New England, it invades native upland forest and wet meadow swamp communities (although generally not forested wetlands with saturated or seasonally inundated soils), particularly along edges where fruit-eating birds may perch. It is a habitat concern due to its ability to outcompete native shrub species, and because its open branching habit provides poor nesting habitat for songbirds.

Fallopia japonica, Japanese knotweed, is a large (1 to 3 meters tall) herbaceous perennial with large heart-shaped leaves and jointed, bamboo-like stems. It was introduced from England as a garden ornamental in the late 1800s. Japanese knotweed's small seeds are not easily dispersed by either wind or birds, and it does not spread or colonize new sites aggressively. Once established, it spreads by underground rhizomes that form extremely dense patches. No other species grow in the dense shade under the large leaves of Japanese knotweed. This species occurs in open disturbed sites, typically the edges of roads or old fields. It does not grow in the shaded forest understory.

Elaeagnus umbellata, autumn olive, is a shrub with distinctive silvery leaves and fragrant flowers. It has a very dense branching habit, and tends to form monodominant patches in dry disturbed sites. This species was widely planted in the 1950s through 1970s for wildlife habitat, and was recommended by the Soil Conservation Service. The bright red berries are bird-dispersed. This species spreads only by seed, and does not colonize or survive in forested sites or wetlands.

Celastrus orbiculata**,** oriental bittersweet, is a deciduous twining vine that may reach 6 inches or more in diameter. The plant was introduced in the mid-1800s, and currently is found from Maine to Georgia. Bittersweet produces attractive fruits with bright orange fleshy seeds in a yellow leathery capsule. Seeds are bird-dispersed. The vine also spreads aggressively through underground rhizomes. Oriental bittersweet can overrun natural vegetation, overtopping trees and shrubs to form pure stands. The vines can weaken trees by weighting the crown, making it more susceptible to wind and ice damage. Bittersweet tends to become established in open areas such as roadsides or old fields, but, once established, can spread into undisturbed forests. It may occur in the wetland-upland transition zone, but does not occur in the saturated soils typical of wetlands.

Rosa multiflora, multiflora rose, is a perennial shrub with distinctive clusters of small white flowers. It was introduced from Asia in the 1880s as an ornamental, and subsequently was widely planted for wildlife food and cover. Multiflora rose has also been planted along highway medians to reduce

headlight glare and provide a barrier to vehicles. Like other berry-producing shrubs, multiflora rose is dispersed by birds (particularly robins and mockingbirds). It invades old fields, pastures, and roadsides, typically in upland sites that are not excessively well-drained (i.e., more mesic sites than autumn olive), and forms very dense monodominant stands that eliminate native shrubs and herbaceous species. Although *Rosa multiflora* may occur in wet meadows, it does not occur in wetland habitats where soils are saturated or seasonally inundated.

Phalaris arundinacea, reed canary-grass, is a perennial grass that grows 1.6 to 6.5 feet tall. It is native to North America as well as Europe. Since it is native to the United States, it may have been present in the northern parts of New England all along. However, European cultivars were introduced in the early 1800 as forage grasses, and are still used for hay. Reed canary-grass readily spreads via rhizomes and can form dense monocultures that does not allow for native species to readily coexist with it. It has little value for wildlife, and can be too dense to serve as cover for waterfowl and small mammals.

Typha angustifolia; T. x glauca, narrow-leaf and hybrid cattail are perennial aquatic plants that can grow up to 9 feet and are generally found in wet areas. Narrow-leaf cattail is considered by some as an invasive species due to its rapid spreading range and ability to form dense monocultures monospecific stands that replace native plants. While *Typha latifolia* is a common native plant, narrow-leaf cattail is believed to have been introduced into North America from ballast of European ships. Hybrid cattail is thought to be sterile (not likely to produce seed) however form large stands by means of vegetative reproduction.

Upland edges in forested habitats may be potentially colonized by invasive species dispersed by birds (primarily the fruit-eating bird species such as American robin, Northern mockingbird, European starling and cedar waxwing) that perch in the trees along the edge of the right-of-way. This creates the potential for establishment of glossy buckthorn, Japanese barberry, multiflora rose, oriental bittersweet or autumn olive on or along the edges of the right-of-way. Common reed seeds could be blow in by wind gusts, although increased wind is unlikely due to the narrow canopy opening.

Any common reed, multiflora rose, autumn olive and Japanese knotweed would be confined to the open habitat of the right-of-way, and would not be anticipated to invade the forested wetlands. Oriental bittersweet would also not invade the forested wetlands, but has the potential to increase the canopy gap by damaging trees along the edge of the right-of-way. Glossy buckthorn and Japanese barberry, if established, could potentially invade the adjacent forested wetlands, although the saturated and seasonally flooded soils that may be found on the sides of right-of way would reduce the potential for successful establishment or spread except on hummocks.

Impacts to Avian Communities Due to Fragmentation and Edge Effects

Fragmentation of forested tracts has been cited as a major cause in the decline of bird communities, particularly neotropical migrant songbirds (NTMs). Scientific studies generally support the positive correlation between size of a forest and reproductive success of NTMs, and that minimum threshold levels are necessary to maintain successful breeding populations. NTMs appear to be especially susceptible to fragmentation and other indirect effects because they generally have fewer offspring than other birds, and certain behavioral adaptations such as ground-nesting increase their vulnerability to predators and brood parasites.

Fragmentation occurs at several spatial scales, from local, which includes edge effects, to landscape, which encompasses differences in size and shape of forest tracts, to regional, where differences in

canopy cover are studied to determine the effects on breeding birds.[34] The majority of the available literature has focused on large-scale fragmentation that breaks existing forest blocks into disconnected remnants across a landscape by major roadways, residential subdivisions, and clear cuts. Most studies do not define a forest fragment unless it is separated from another forest patch by 300 feet of open land.[35]

Scientific literature provides some information on the size of forests needed to support populations of NTMs. These studies document a positive correlation between the presence and abundance of NTMs, their reproductive success, and the size of a forest block.[36,37,38,39,40] The "core" or interior area necessary to maintain successfully reproducing populations varies widely, depending on the species context. In landscape studies, NTMs have been found to require areas at least 250 acres to maintain successful reproductive populations.[41,42] In general, smaller isolated forest blocks are thought to be "sinks" where local populations are likely to undergo frequent extinction and recolonization, and larger forest blocks are thought to be "sources" which maintain stable populations and from which birds disperse to colonize smaller sites.[43,44]

Some birds that breed in the Hockomock Swamp, such as brown creeper, ovenbird, and northern waterthrush, require large, unbroken tracts of forest to maintain successful populations. Such species are considered "area-sensitive" and may be more susceptible to edge effects and other indirect results of forest fragmentation than more disturbance-tolerant species. Forest areas that are less than 12 to 25 acres do not support area-sensitive, forest-nesting NTMs.[45,46,47] The available studies indicate that forest blocks smaller than 60 acres may contain nesting NTMs, but that reproductive success is limited and species diversity is low. These should be considered "small."[48, 49]

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34 Robinson, S.K. 1998 Another threat posed by forest fragmentation: reduced food supply. *Auk,* 115(1): 1-3.

35 Rich, A.C., D.S. Dobkin, and L.J. Niles. 1994. Defining forest fragmentation by corridor width: the influence of narrow forest-dividing corridors on forest-nesting birds in southern New Jersey. *Conservation Biology* 8(4): 1109-1121.

36 Ambuel, B. and S.A .Temple. 1983. Area-dependent changes in the bird communities and vegetation of southern Wisconsin forests. Ecology, 64(5), 1983. pp. 1057-1068.

37 Askins, R.A.; M.J. Philbrick and D.S. Sugeno Relationship between regional abundance of forest and the composition of forest bird communities. *Biological Conservation* 39, pp. 129-152.

38 Blake, J.G. and J.R Karr. 1984. Species composition of bird communities and the conservation benefit of large versus small forests. *Biological Conservation*. 30:173-187.

39 Freemark, K. and B. Collins. 1989. Landscape ecology of birds breeding in temperate forest fragments. In Ecology and conservation of neotropical migrant landbirds (J.M. Hagan & D. W. Johnston, eds.). Smithsonian Institution Press, Washington D.C.

40 Flather, C.H. and Sauer, J.R. 1996. Using landscape ecology to test hypotheses about large scale abundance patterns in migratory birds.*Ecology*. 77(1): 28-35.

41 Sorrell, J.P. 1997. Using Geographic Information Systems to evaluate forest fragmentation and identify wildlife corridor opportunities in the Catarqui watershed. http://wgs.nhb.com/sorrell/index.htm/.

42 Robbins, C.S., D.K. Dawson, and B.A. Dowell. 1989. Habitat area requirements of breeding birds in the middle Atlantic states. *Wildlife Monographs*. No. 103.

43 Donovan, T.M., F.R. Thompson III, J. Faaborg, and J.R. Probst. 1995. Reproductive success of migratory birds in habitat sources and sinks. *Conservation Biology*. 9(6): 1380–1395.

44 Robinson, S.K., F.R. Thompson III, T.M. Donovan, D.R. Whitehead, and J. Faaborg. 1995. Regional forest success and the nesting success of migratory birds. *Science*. 267: 1987-1990.

45 Blake, J.G. and J.R Karr. 1984*. Ibid.*

46 Herkert, J.R. 1993. The effects of habitat fragmentation on midwestern grassland bird communities. Ecological Applications Vol. 4 No.3 pp. 461-471.

47 Freemark, K. and B. Collins. 1989. *Ibid.*

48 Donovan, T.M., F.R. Thompson III, J. Faaborg, and J.R. Probst. 1995. Reproductive success of migratory birds in habitat sources and sinks. *Conservation Biology*. 9(6): 1380–1395.

49 Villard, M., P.R. Martin and C.G. Drummond. 1993. Habitat fragmentation and pairing success in the ovenbird *(Seiurus aurocapillus). Auk* 110(4) pp. 759-768.

Studies indicate that moderately-sized forest blocks averaging 125 to 150 acres are likely to support some NTMs, particularly the "common" species such as rose-breasted grosbeak [*Pheucticus ludovicianus*], red-eyed vireo [*Vireo olivaceous*], or eastern peewee, but do not support the less common area-sensitive species such as yellow-throated vireo [*Vireo flavifrons*], hermit thrush [*Catharus guttatus*], or veery.[50, 51] Large forest blocks, which provide sufficient contiguous forest-interior habitat to support successfully reproducing populations of area-sensitive forest-interior nesters such as ovenbird or Louisiana waterthrush [*Seiurus motacilla*], must be over 500 acres.[52] Several studies suggest that 750 to 1,200 acres are necessary, and that even larger areas in excess of 7,500 acres are optimal.[53, 54, 55, 56]

Predation is an indirect effect associated with forest fragmentation, and may increase as opportunist predators such as crows [*Corvus brachyrhynchos*] and raccoons [*Procyon lotor*] move into the edges adjacent to the project alignment. However, the existing active railbeds are open, and the inactive segments (Hockomock Swamp, Pine Swamp, and the Whittenton Branch) are used as trails, so there are likely to be existing predation-related edge effects under existing conditions. Segments adjacent to an open overhead powerline clearing may exhibit similar characteristics. There may also be increased brood-parasitism on songbirds if brown-headed cowbirds (*Molothrus ater*) colonize the edges adjacent to the rail. However, it is unlikely that large numbers of cowbirds will colonize the reconstructed right-of-way because the increase in canopy width is minimal. One study found that brown-headed cowbirds were significantly more abundant along paved secondary road forest edges than along either unpaved roads or powerline corridors.[57] This study also showed that there was no significant reduction in forest-interior nesters where corridors were less than 25 feet wide.

Also, it is possible that the commuter rail will displace some individuals of wildlife populations that are sensitive to noise and vibration, causing increased competition for nearby suitable habitat. Woodland songbirds such as the black-billed cuckoo (*Coccyzus erythropthalmus*) have been shown have lowered reproductive success adjacent to noise sources, where these sources produce continuous high noise levels, possibly due to increased stress hormones, interference with communication during the breeding season, or reduced food supply from noise avoidance of prey.[58] Most of the scientific studies conducted on noise and wildlife involve assessing impacts from roads, and there is limited scientific data for impacts to wildlife from rail. Most studies show that noise associated with high-density roads impacts avian communities by interfering with communication during courtship and brood-rearing. However, the continuous noise resulting from highways is substantially different from the infrequent noise produced by trains. Noise impacts are expected to be minor because of the low numbers of trains and relatively low noise associated with single-welded rail.

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[50] Freemark, K. and B. Collins. 1989. *Ibid.*

[51] Robbins *et al.* 1989. *Ibid.*

[52] Finch, D.M. 1991. Population ecology, habitat requirements, and conservation of neotropical migrant birds. USDA Forest Service Technical Report RM-205.

[53] Donovan *et al.* 1995.

[54] Faaborg, J., M. Brittingham, T. Donovan and J. Blake. 1995. Habitat fragmentation in the temperate zone. *In*: Ecology and management of neotropical birds: a synthesis and review of critical issues. T.E. Martin and D.M. Finch, eds. Pages 357-380.

[55] Gibbs, J.P. and J. Faaborg. 1990. Estimating the viability of ovenbird and Kentucky warbler populations in forest fragments. Cons. Biol. 4(2): 193-196.

[56] Porneluzi, P., J.C. Bednarz, L.J. Goodrich, N. Zawada, and J. Hoover. 1993. Reproductive performance of territorial ovenbirds occupying forest fragments and a contiguous forest in Pennsylvania. Cons. Biol. 7(2): 618-622.

[57] Rich, A.C., D.S. Dobkin, and L.J. Niles. Defining forest fragmentation by corridor width: the influence of narrow forest-dividing corridors on forest-nesting birds in southern New Jersey. *Conservation Biology* 8(4): 1109-1121.

[58] Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecological Systems. 29:207-31.

Impacts to Reptile or Amphibian Communities Due to Fragmentation

A railroad corridor may act as a barrier that interferes with the movement of amphibians and reptiles from one habitat to another. The width of a railroad corridor can influence the frequency of wildlife crossings, as well as the mortality associated with potential collisions with rail traffic. The railbed on which the tracks are laid can itself create a barrier to smaller species such as amphibians, reptiles, and smaller mammals. Traffic density and traffic speed may also influence wildlife avoidance of transportation corridors.[59, 60, 61, 62] The existing rail and highway rights-of-way currently provide limited habitat for reptiles and amphibians.

Indirect impacts to reptile and amphibian populations could include lowered reproductive success of existing amphibian populations if rail collisions affect amphibian mortality rates. If the rail is experienced as a barrier by migrating amphibians, existing populations may be divided into subpopulations. This, in turn, may result in a reduced gene pool in the remaining subpopulations, which could result in loss of the population if the remaining genetic variation is not diverse enough to offset the joint action of natural selection and genetic drift. Preserving genetic diversity is important because it allows populations the potential to adapt by “saving” genes that may be useful during future environmental changes. However, the rail will not create a complete barrier to movement between the eastern and western sides of the right-of-way.

Indirect Impacts to Vernal Pool Species

Indirect effects change the quality or functions of a resource and can be caused by a number of factors:

- Direct fill to vernal pools, which reduces the size of the pool;
- Impacts to vernal pool habitat (wetland areas within 100 feet of a vernal pool);
- Impacts to immediate upland buffer habitat (naturally vegetated, undeveloped upland areas within 100 feet of a vernal pool);
- Impacts to surrounding upland habitat (naturally vegetated, undeveloped upland areas between 100 and 750 feet from a vernal pool); and
- Habitat fragmentation.

Direct fill to vernal pools can have indirect impacts in addition to the direct impacts discussed in the previous section. By reducing the volume of water that collects in a given pool, fill to portions of a vernal pool may increase the chances that the pool will warm up more quickly during the season and/or dry out completely before species have matured enough to leave the pool. In some cases, early warming can be beneficial by speeding larval growth. However, pools that dry out early have a reduced ability to provide effective breeding habitat.

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[59] Reijnen, R. R. Foppen, C. ter Braak, and J. Thissen. 1995. The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads. Journal of Applied Ecology. 32: 187-202.

[60] Reijnen, R., R. Foppen, and H. Meeuwsen. 1996. The effects of traffic on the density of breeding birds in Dutch agricultural grasslands. Biological Conservation. 75: 255-260.

[61] Reijnen, R. 1995. Disturbance by car traffic as a threat to breeding birds in The Netherlands. PhD thesis, DLO Institute of Forestry and Natural Resources. Wageningen, Netherlands.

[62] Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecological Systems. 29:207-31.

Filling vernal pool habitat results in losses of wetlands in the vicinity of a given pool; these losses can affect pools in several ways. Losses of wetlands, particularly mature forested wetlands, close to a given pool can reduce the shading over the pool, which contributes to increased warming and drying effects. Loss of wetlands near vernal pools also reduces the amount of leaf litter and detritus that seasonally falls into the pool. Since these detrital inputs form the basis of the food web for the pool, reducing these inputs results in a loss of the pool's overall ability to sustain healthy populations. Loss of wetlands near the pool also reduces the available non-breeding habitat for species that use the pools, and can therefore impact biodiversity in the pool. However, for many "classic" vernal pools that consist only of a confined basin depression, there are no adjacent wetland areas at all, and the entire surrounding area provides upland buffer habitat.

Upland buffer habitat is also a necessary component of a vernal pool ecosystem. This habitat is undeveloped land with natural vegetation that provides upland non-breeding habitat and/or migratory habitat for vernal pool species. Many obligate vertebrate vernal pool species, such as wood frogs and spotted salamanders, spend the majority of a given year in the upland areas near vernal pools, using these areas for foraging, shelter, and overwintering. A loss of upland buffer habitat translates to a loss in the ability of the area to provide a necessary component of the life cycle of these obligate species. Mature forested uplands in particular can provide valuable habitat for species, since treefalls, rotting logs, and heavy leaf cover all provide shelter and foraging opportunities for obligate vernal pool species.

Surrounding upland habitat is important for providing additional foraging, shelter, and overwintering habitat for many obligate vernal pool species. Some species have a lifespan of several years or more, and often these animals will travel several hundreds of feet away from a vernal pool, then return to the same pool or cluster of pools each spring to breed. Surrounding upland habitat thus maintains a healthy species density and distribution.

The effects of habitat fragmentation can create additional indirect impacts on vernal pools and the species that use the pools. Habitat fragmentation is of particular concern where the rail line has been abandoned and only portions of the original berm exist. In these cases, construction of new tracks and widening of existing berms as a result of the project would create additional barriers to movement. The project would create a barrier to wildlife movement through portions of the Hockomock Swamp area (north of the proposed trestle and south of Raynham Park station) and through the entire Pine Swamp. This barrier effect is likely to fragment populations of vernal pool amphibians that are unable to cross the railroad tracks. Areas with existing tracks (whether active or not and especially those on top of steep embankments), are likely to provide some current barrier to movement, although some movement across existing rail lines can occur through gaps and openings under rails and between rail ties. Constructing the railroad would create more areas of steep slopes, wider portions of ballast, an expanded railroad bed from single track to multiple tracks, and new retaining walls in many locations, all of which would increase the effects of habitat fragmentation on vernal pool amphibians.

Impacts to Mammalian Communities Due to Fragmentation

Direct impacts include collisions between mammals and trains. Indirect impacts from fragmentation include potentially lowered reproductive success rates from interruption of migration routes to breeding areas (restricted gene flow), increased predation on small mammals due to lack of cover on the ballasted railroad embankment, and general disturbance of mammalian communities immediately adjacent to the right-of-way. These disturbances include alterations to foraging, denning and overwintering habitat due to changes in vegetative cover and light and temperature regimes.

There may be minor indirect impacts to small mammals but this is not expected to affect population stability because of their small home ranges. Deer are expected to continue to cross the tracks with minimal impedance.

Impacts to Wildlife from Noise

The study of noise and its effects on wildlife, or acoustic ecology, began in the 1970s, and several papers have been published documenting the effects of noise on wildlife populations. However, most of the research to date has been on noise generated from aircraft and sonic booms, with few studies on vehicle and rail traffic. Studies have also focused more on laboratory animals than wildlife because of the logistical difficulties and costs associated with evaluating noise effects in the wild. Comments on the DEIS/DEIR asked the applicant to provide additional information on the effects of noise on wildlife specific to the habitat surrounding the alternatives and reference scientific literature as appropriate.

There is currently no accepted method of measuring the effects of noise on wildlife. Most of the research to date indicates that the sound exposure level (SEL) provides the most useful predictor in noise effects. Because wildlife differ in their sensitivities to noise from humans, and amongst other species, (*e.g.,* bats are sensitive to a greater sound frequency than humans, while bullfrogs have a much lower detection range), an A-weighted scale was devised. The A-weighted scale interprets the sound based on the loudness perceived by the listener.

Noise can induce physiological and behavioral responses in animals. Effects are most often noted when the noise source is brief in duration and in excess of 100 dB.[63,64] Physiological stress can include higher adrenal weights and ascorbic acid levels, and increased cortisol levels, which play a role in the stress reaction. Prolonged exposure to loud, abrupt noise (such as sonic booms) may decrease the life expectancy, induce weight loss, and lower reproductive success of animals that cannot move away from the noise source. Prolonged exposure to very high noise levels may also result in loss of hearing for animals that are unable to relocate from the noise source.

Behavioral responses of wildlife to noise are somewhat easier to document in the field. Noise may result in masking, which is the inability of animals to communicate effectively. This may have effects on reduced breeding success for courting birds that are unable to advertise territories or secure mates, lowered prey captures for species that depend on auditory cues to locate food, increased mortality for species that rely on hearing predators approach in order to escape, or increased mortality associated with winter-stressed animals attempting to escape a perceived threat.

Some wildlife species habituate to noise. Upland sandpipers (*Bartramia longicauda*), a state-listed species, are most frequently found nesting in airfields and adjacent open spaces in the northeast. Research has shown that some species, such as terns, caribou, and grizzly (none of which have been documented to occur within the study area), do not habituate but continue to experience each noise event as a stressor.

[63] USEPA Office of Noise Abatement and Control. 1973. Public health and welfare criteria for noise. Government Publication 550/9-73-002. Washington, D.C.

[64] Bradley, F., C. Book, and A.E. Bowles. 1990. Effects of low-altitude aircraft overflights on domestic turkey poults. Report No. HSD-TR-90-034. US Air Force Systems Command, Noise and Sonic Boom Impact Technology Program.

The loudest noise that the commuter rail will emit is the whistle as it approaches at-grade crossings (105 dB). Under normal operating conditions, the train will produce a noise disturbance of between 80 and 88 dB that is infrequent, short in duration, and is below potential impact thresholds.

Scientific literature and other relevant publications concerning the effects of train pass-by noise on wildlife were reviewed. Many of the available studies are from western states; far less is known about the effects in the eastern United States, presumably because highway and rail infrastructure was largely already in place well in advance of the advent of modern wildlife ecology and conservation biology, and also because of the proportionately larger numbers of endangered mammals long displaced in the east and now confined to the less-developed west. As documented in the National Park Service's Annotated Bibliography – Impacts of Noise on Wildlife,[65] the effects of noise on wildlife have been studied for roads (where noise is continuous), aircraft, boats, and off-road vehicles and snowmobiles. No specific studies on the effects of trains are listed in this bibliography. The FHWA's Highway Traffic Noise website provides an extensive discussion of the impacts of road and highway noise on all classes of wildlife and concludes that different groups of wildlife respond to highway noise in different ways. The FHWA notes that very few studies have directly addressed the impact of noise from roads, and that studies primarily focus on the distribution and abundance of wildlife in areas adjacent to roads. As a result, the effects of noise cannot be separated from the effects of mortality or barriers to movement. The only mention of trains in the FHWA document is this passage: "It has been found that various mammals will avoid roads and (in some cases) this has been attributed to noise… For example, mountain goats would hesitate to cross the road if they heard a truck changing gears over 1 kilometer away. Passing vehicles in this study were perceived as a threat (speed limit 50 mph). Interestingly, the goats did not seem to be disturbed by the noise from trains." The literature review regarding analysis of effects of train pass-by noise on wildlife also included recent Environmental Impact Statements available on the Federal Railroad Administration (FRA) website. This review did not indicate additional information regarding potential impacts or assessment methods beyond those previously described in the DEIS. In absence of additional indirect noise impact assessment methods identified in more recent applicable scientific studies the assessment method for the FEIS remained unchanged from the DEIS.

CAPS Analysis

The University of Massachusetts' Conservation Assessment and Prioritization System (CAPS) model was used as a supplemental method of evaluating indirect impacts to biodiversity. CAPS is a computer software program designed to assess the ecological integrity and biodiversity value of every location based on natural community-specific models, in order to help prioritize lands for conservation action based on their assessed ecological value. It provides a quantitative assessment of ecological integrity that can be used to compare various scenarios. Appendix 4-14-B provides the complete UMass CAPS analysis report for the South Coast Rail project. More information about CAPS can also be found at the University of Massachusetts web site: http://www.umass.edu/landeco/research/caps/caps.html.

About CAPS

As stated in the Conservation Assessment and Prioritization System (CAPS) South Coast Rail Analysis[66]:

[65] National Park Service Annotated Bibliography-Impacts of Noise on Wildlife. Available online at http://www.nature.nps.gov/sound/assets/docs/Wildlife_AnnotatedBiblio_Aug2011.pdf.

[66] Conservation Assessment and Prioritization System (CAPS) South Coast Rail Analysis, B. W. Compton, S. D. Jackson and K. McGarigal, September 18 2009.

"[T]he Conservation Assessment and Prioritization System (CAPS) is an ecosystem-based (coarse-filter) approach for assessing the ecological integrity of lands and waters. We define ecological integrity as the ability of an area to support biodiversity and the ecosystem processes necessary to sustain biodiversity, over the long term. CAPS is a computer software program and an approach to prioritizing land for conservation based on the assessment of various ecological communities (e.g. forest, shrub swamp, headwater stream) within an area. This approach combines principles of landscape ecology and conservation biology with the capacity of modern computers to compile spatial data and characterize landscape patterns.

"The CAPS approach begins with the characterization of both the developed and undeveloped elements of the landscape (Appendix A). With a computer base map depicting various classes of developed and undeveloped land, we then evaluate a variety of landscape-based variables ("metrics"; Appendix C). A metric may, for example, take into account how well a point in the landscape is connected to similar points, the intensity of traffic on nearby roads, or the expected vulnerability to invasions by exotic plants. The results of each metric are rescaled by percentiles for each community so that, for instance, the best 10 percent of marshes have values greater than or equal to 0.90, and the best 25 percent have values greater than or equal to 0.75. This is done to adjust for differences in units of measurement among metrics and to account for differences in the range of metric values for each community. The rescaling by community is done to facilitate identifying the "best" of each community, as opposed to the best overall—which is strongly biased towards the dominant, matrix-forming communities.

"Various metrics are applied to the landscape and then integrated in weighted linear combinations as models for predicting ecological integrity. The rescaled values are weighted using weights determined by expert teams, to reflect the relative importance of each metric for each community (Appendix D), and then added together to compute an overall IEI. Thus, the final index of ecological integrity for each cell is a weighted combination of the metric outputs for that cell, based on the community the cell falls in. This process results in a final Index of Ecological Integrity (IEI) for each point in the landscape based on models constructed separately for each ecological community.

"Because CAPS provides a quantitative assessment of ecological integrity it can be used for comparing various scenarios. In essence, scenario analysis involves running CAPS separately for each scenario, and comparing results to determine the loss (or gain) in IEI units. This scenario testing capability can be used to evaluate and compare the impacts of development projects on habitat conditions as well as the potential benefits of habitat management or environmental restoration. CAPS is an objective and flexible approach for assessing ecological integrity and supporting decision-making for land protection, habitat management, ecological restoration, project review and permitting to protect habitat and biodiversity."

Methods Used for the South Coast Rail Analysis

The CAPS analysis was based on the most recent CAPS statewide run (CAPSma 2009, Conservation Assessment and Prioritization System (CAPS) Preliminary Statewide Massachusetts Assessment, June 2, 2009) with modifications as necessary to more fully represent the effects of railroads.

The geographic scope of the analysis (Figure 4.14-15) includes the entire Taunton River watershed, plus a 5-kilometer (3.2 miles) buffer around the project elements outside of the Taunton River Watershed

(the Northeast Corridor, the Fall River Secondary, and the New Bedford Main Line). This buffer allows CAPS to capture all changes in IEI among scenarios. Using the entire Taunton River Watershed gives CAPS a large enough context to reasonably scale IEI.

CAPS was modified for this analysis to better represent the effects of railroads on biodiversity. The principal effects are barriers to wildlife movement and traffic intensity (which results in noise, disturbance, and mortality). These modifications included:

Several new cover types were added to CAPS to represent rail lines. Rail classes included “abandoned rail with tracks”, “abandoned rail without tracks”, “commuter rail with a trestle”, and “commuter rail with a retaining wall”. Abandoned rail lines represented in CAPS from MassGIS were considered to have no tracks except where they were more accurately represented in the South Coast Rail data.

Numbers of tracks (1, 2, 3) were estimated based on MassGIS data and information from the SCR conceptual design. In general, the SCR scenarios were represented as having two sets of tracks. All rails were assumed to be unfenced, since commuter rails are typically fenced only in developed areas.

The analysis estimated train frequency on each segment as 2 freight trains per day and 33 commuter rail trains. The number of Amtrak passenger trains was determined using the Amtrak schedules. Train length was estimated at 25 cars/train for freight trains, 6 cars/train for commuter rail trains and 8 cars/train for Amtrak passenger trains. The traffic rate parameter was set at one rail car = 20 automobiles except for the trestle alternatives, which used one rail car = 6.7 automobiles to account for a lower “roadkill” mortality.

The parameters of new cover types were developed by an expert team including representatives of The Nature Conservancy, MassAudubon, MassWildlife, and UMass Amherst. The team also developed a new variable (terrestrial barriers) which includes various anthropogenic barriers to wildlife movement. The values assigned to terrestrial barriers ranged from 1 (no barrier, abandoned rail without tracks) to 10 (noise barrier or retaining wall).

The CAPS model was run for each alternative listed below:

- Current (base) scenario
- No-Build Alternative
- Stoughton Alternatives (without a trestle)
- Stoughton Alternatives (with a trestle)
- Whittenton Alternatives (without a trestle)
- Whittenton Alternatives (with a trestle)

The analysis calculated the direct loss of IEI by the complete loss of IEI for affected cells (cells which fell within the stations or new right-of-way). Indirect loss was calculated for each metric, and the integrity model was used to create an overall indirect loss grid for each alternative.

A sensitivity analysis was conducted by varying the relative traffic rate for trains, from 1 rail car = 5 automobiles, to 1 rail car = 100 automobiles. The sensitivity analysis was run for the three metrics that are affected by the intensity of the barrier and by traffic rate: connectedness, similarity, and traffic intensity. The sensitivity analysis, showing the range of expected results given the uncertainty in the effects of train traffic, shows that although traffic rates have a moderate effect on absolute loss in IEI, the ranking of the alternatives does not change under either the high or low traffic scenarios. The sensitivity analysis suggests that the uncertainty in accounting for traffic effects of railroads has only a minor effect on the relative results.

4.14.3.2 Impacts of Alternatives by Element

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would consist of enhancing current bus service along existing roads and highways. The alignments would not change and no new highway construction would be required for the No-Build Alternative. Three existing Park-and-Ride facilities would be re-striped to improved capacity and traffic flow as part of the No-Build Alternative. The three affected Park-and-Ride facilities are:

- The West Bridgewater Park and Ride, located near the southwest corner of the intersection of Routes 106 and 24 in West Bridgewater
- The Mount Pleasant Street Park and Ride, located on the northwest corner of the intersection of King's Highway and Route 140 in New Bedford
- The Silver City Galleria Park and Ride, adjacent to the Silver City Galleria shopping mall in Taunton

Biodiversity would not be adversely affected by this alternative, as there would be no loss of natural habitats and no new habitat fragmentation.

Southern Triangle (Common to All Rail Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all rail alternatives. These rail lines form a rough triangular shape running south from Myricks Junction to Fall River (the Fall River Secondary) and from Weir Junction through Myricks Junction to New Bedford (the New Bedford Main Line), and are therefore referred to as the Southern Triangle. There are no Areas of Critical Environmental Concern (ACECs) within the Southern Triangle. The following sections describe the environmental consequences to biodiversity that may result from each alternative of the South Coast Rail project which is inclusive of the Southern Triangle.

Stoughton Electric Alternative

The Stoughton Electric Alternative includes improvements to existing active freight or commuter rail lines (from Weir Junction to Dean Street, and north of Stoughton Station) and track construction on out-of-service or abandoned rights-of-way (between Dean Street and Stoughton Station as well as the Southern Triangle. It includes constructing a trestle through part of the Hockomock Swamp to reduce impacts to wetlands, biodiversity, and rare species. A section of the out-of-service line crosses land within the Hockomock Swamp ACEC.

Biomap Core Habitats

The Stoughton Alternative would cross Biomap Core Habitat in two areas. The Hockomock Swamp, from Foundry Street in Easton south to Bridge Street in Raynham, is designated as Core Habitat. Pine Swamp in Raynham, from King Philip Street to East Britannia Street, is also a Biomap Core Habitat.

The Stoughton Electric Alternative would create a barrier to wildlife movement through portions of the Hockomock Swamp area (north of the proposed trestle and south of Raynham Park station) and through the entire Pine Swamp. This barrier effect is likely to fragment populations of small vertebrates (e.g. small mammals, reptiles, and amphibians) that are unable to cross the railroad tracks. The portion of the Stoughton Electric Alternative that is a proposed trestle (approximately 8,500 feet long) would not impede wildlife movement.

The Stoughton Electric Alternative would create a new canopy gap through portions of the Hockomock Swamp, primarily from Foundry Street south to the proposed Raynham Park station, where the forest canopy has partially closed over the railbed since the tracks were removed. This canopy gap could impede the movement of forest interior birds across the right-of-way, reducing the effective size of the forest block, and would create new “edge effects” of increased light and temperature, and decreased humidity, adjacent to the right-of-way. The barrier effects of the Stoughton Electric Alternative would extend upward from the tracks as a result of the overhead catenary system. Reconstructing the rail line would create and maintain a canopy gap that varies with the width of the limit of work. This gap would divide the Hockomock swamp south of Foundry Street into two units of approximately 2,293 acres west of the rail line and 505 acres east of the rail. These areas are further divided by the existing powerline corridor, as shown on Figure 4.14-16. On the east side of the MBTA right-of-way there are two blocks divided by the powerline with the northeast quadrant totaling 157 acres and the southeast quadrant totaling 348 acres. On the west side of the MBTA right-of-way, there are two blocks divided by the powerline with the northwest quadrant totaling 84 acres and the southwest quadrant totaling 2,209 acres.

Removing the forest canopy on the railbed within the Hockomock Swamp ACEC study area could potentially alter the physical conditions (light, wind, temperature) in adjacent forested areas. No adverse effects are anticipated to herbaceous or shrub dominated communities, since there would be no change in the light, wind or temperature regimes. The canopy gap is anticipated to be approximately 40 feet in width for the length of the trestle, and the resulting forest edges will face east and west.

During the original construction of the embankment through the Hockomock Swamp in the 1840s, alterations to the hydrology of the Swamp occurred. This is evident in the existing vegetation of the area. Currently, surface water occurs at a slightly higher elevation on the western side of the embankment. Water flows from west to east through all culverts beneath the embankment. This alternative would not include repair or replacement of any culverts. Therefore, there would be no potential changes to hydrology, and no potential impacts to community structure or composition.

Reconstructing the railroad track system through the Hockomock Swamp ACEC would increase the width of the canopy gap over the railbed to approximately 30 feet wide in areas with single track (through the Hockomock and Pine Swamps) and somewhat wider in in areas with double track (north of North Easton Station and a segment south of the trestle near Raynham Park Station), and would require the removal of existing vegetation on the elevated railbed. Canopy clearance requirements will be specified in the Vegetation Management Plan.

This linear gap, extending through natural communities, which include Atlantic white cedar swamp and red maple swamp, may allow invasive plant species to colonize the railbed or areas adjacent to the railbed. This section examines the invasive species that may potentially be introduced, assesses the likelihood and magnitude of the impacts, and identifies monitoring and mitigation measures.

Within the Hockomock Swamp ACEC, common reed has become established in the open, disturbed wetlands within the powerline corridor; and has sparsely penetrated approximately 15 to 20 feet into the adjacent red maple swamp by rhizome growth (although not vigorous, due to dense shade). It is well-established in open wetlands throughout Pine Swamp, particularly under the existing powerline corridor. Glossy buckthorn is sporadically established along the dirt road within the powerline corridor and occasionally on hummocks within the red maple swamp south of the powerline corridor. Autumn olive has not been observed within the study area, but is present on the old ballast between I-495 and Carver Street. Oriental bittersweet is sparsely established along the dirt road within the powerline corridor. Multiflora rose is sparsely established along the dirt road within the powerline corridor; and more abundantly on the old ballast south of I-495.

Any common reed, multiflora rose, autumn olive and Japanese knotweed would be confined to the open habitat of the right-of-way, and would not be anticipated to invade the forested wetlands. Oriental bittersweet would also not invade the forested wetlands, but has the potential to increase the canopy gap by damaging trees along the edge of the right-of-way. Glossy buckthorn and Japanese barberry, if established, could potentially invade the adjacent forested wetlands, although the saturated and seasonally-flooded soils on the west side of the right-of-way would reduce the potential for successful establishment or spread except on hummocks. There is a low likelihood of successful establishment of common reed in the closed-canopy red maple or Atlantic white cedar swamps due to the dense shade and lack of soil disturbance. For these reasons, purple loosestrife is also not anticipated to invade the ACEC swamps. The trestle, since it would minimize earth disturbance and vegetation management along the right-of-way, would be expected to result in less potential for invasive species introductions than at-grade rail construction.

Although the Stoughton Alternative would increase the canopy gap and create a partial barrier to vertebrate movement in areas north, and south, of the proposed trestle, Hockomock Swamp would continue to provide moderate- to large-sized forest blocks. West of the right-of-way, there would be two forest blocks, one north and one south of the powerline corridor. The southern block constitutes the majority of Hockomock Swamp and will provide 2,209 acres of continuous forest. The northern block will continue to provide sufficient size (84 acres) to support all area sensitive species successfully that currently may be present. The eastern segments at 157 acres north of the powerline corridor and 348 acres south of the powerline corridor will likely also continue to provide habitat for area-sensitive NTMs.

Predation is an indirect effect associated with forest fragmentation, and may increase as opportunist predators such as crows and raccoons move into the edges adjacent to the project alignment. However, the existing railbed is open and used as a trail, so there are likely to be predation-related edge effects under existing conditions. Through the Hockomock Swamp, the existing upland berm will not be widened, and therefore the possibility that this will be used as a trail by ground predators is not likely to be any different than under existing conditions.

There may also be increased brood-parasitism on songbirds if brown headed cowbirds colonize the edges adjacent to the rail. However, it is unlikely that large numbers of cowbirds will colonize the reconstructed right-of-way because the increase in canopy gap width is minimal. One study found that

brown headed cowbirds were significantly more abundant along paved secondary road forest edges than along either unpaved roads or powerline corridors. This study also showed that there was no significant reduction in forest interior nesters where corridors were less than 25 feet wide.

The trestle is not expected to have direct effects to reptile or amphibian movements in Hockomock Swamp. The structure will be elevated approximately 5 feet above the existing railroad berm, and therefore will not impede movement across or along the right-of-way. This is not expected to result in loss of nesting habitat because there would be no construction on the existing berm except for pilings, and the habitat characteristics of open sandy soil will not be altered. Minor indirect impacts are anticipated from the trestle. These may include an aversion to using the existing nesting habitat along the rail. However, it is possible that turtles along the MBTA right-of-way will seek other areas to nest.

This alternative would not create a new canopy gap or expand the canopy gap in Pine Swamp, because Taunton Municipal Power and Light which currently owns the former rail right-of-way already maintains a linear clearing in the canopy to accommodate an overhead power line corridor below which the proposed tracks would be located. Pine Swamp consists of approximately 475 acres of forest, bounded by King Philip Street and developed areas to the north and east, Route 138 to the west, and developed areas and Thrasher Street to the south. Based on its size, Pine Swamp likely supports common NTMs, and may support other, more area sensitive species.

Living Waters

The Stoughton Alternative is adjacent to Living Water Core Habitat (LW080) near a reach of the Taunton River that provides habitat for Atlantic sturgeon. As noted in Section 4.15.3.3, the NMFS stated it is unlikely that any species listed under their jurisdiction will be exposed to any direct or indirect effects of the proposed South Coast Rail project. The right-of-way crosses this section of the Taunton River for approximately 125 feet, south of Weir Junction in Taunton (Figure 4.14-3a). North of Weir Junction, the Stoughton Alternative crosses the Taunton River three more times on a series of bridges located upstream from the area mapped as Living Water (LW080) (Figure 4.14-5e). The proposed reconstruction would not have a direct or indirect effect on the ability of the Taunton River to support aquatic biodiversity.

Portions of the Acushnet Cedar Swamp, particularly Turner Pond, are designated as Living Waters. The proposed reconstruction of the New Bedford Main Line would be approximately 7,500 feet west of Turner Pond and would not have a direct or indirect effect on the ability of the pond to support aquatic biodiversity.

Fisheries Habitat

The Stoughton Alternative crosses Whitman Brook, Queset Brook, Black Brook, Pine Swamp Brook, Taunton River, Mill River, Cotley River, Cedar Swamp River, and Fall Brook which are all important fisheries habitats. The proposed alternative would reconstruct existing bridges at Whitman Brook, Queset Brook, Black Brook, Pine Swamp Brook, Cedar Swamp River and the Taunton River, and would construct a new bridge at Black Brook (the former rail bridge was washed out). These bridges would be reconstructed with the same or wider opening, maintaining habitat connectivity and the riverine substrate. The capacity of these waters to support aquatic diversity would not be adversely affected.

Breeding Bird Diversity

This section discusses potential impacts to breeding bird populations within each of the key avian habitat areas.

Hockomock Swamp—The railroad alignment through the Hockomock Swamp, under existing conditions, largely has a closed forest canopy in the segment between Foundry Street and the proposed Raynham Park Station. South of the proposed station, the right-of-way is maintained as an overhead power line corridor and trail used by pedestrians and ATVs. Converting the out-of-service railroad alignment to active rail would not increase or create a new canopy gap, and therefore would not change the existing forest interior conditions. Reconstructing the railroad track system through the Hockomock Swamp will increase the width of the canopy gap over the railbed to 30 feet wide in areas with single track.

Although the Stoughton Alternative would increase the canopy gap and create a partial barrier to vertebrate movement in areas north, and south, of the proposed trestle, the Hockomock Swamp would continue to provide moderate- to large-sized forest blocks. West of the right-of-way, there would be two forest blocks, one north and one south of the powerline corridor. The southern block constitutes the majority of Hockomock Swamp and will provide 2,557 acres of continuous forest. The northern block will continue to provide sufficient size to support all area sensitive species successfully that currently may be present. The eastern segments at 157 acres north of the powerline corridor and 348 acres south of the powerline corridor will likely also continue to provide habitat for area-sensitive NTMs.

Pine Swamp—The railroad alignment through Pine Swamp, under existing conditions, is maintained as an overhead power line corridor and trail used by pedestrians and ATVs. Converting the out-of-service railroad alignment to active rail would not increase or create a new canopy gap, and therefore would not change the existing forest interior conditions. There would be some loss of open shrub vegetation along the powerline, potentially reducing the available breeding habitat for birds such as catbird, common yellowthroat, or song sparrow. However, routine maintenance of the corridor by Taunton Municipal Power and Light already results in frequent and ongoing clearing of shrubs and saplings (and concomitant impacts to bird species) in this area. The re-introduction of trains would have a negligible effect on breeding bird usage.

Assonet Cedar Swamp—The Assonet Cedar Swamp is crossed by active freight rail lines under existing conditions. The reconstruction of the active rail line would not create a new canopy gap, and would therefore not change the existing forest interior or edge conditions. The only change to bird habitat would be increased train passage.

Freetown-Fall River State Forest—The Freetown-Fall River State Forest is crossed by active freight rail lines under existing conditions. The reconstruction of these active rail lines would not create a new canopy gap, and would therefore not change the existing forest interior or edge conditions. The only change to bird habitat would be increased train passage.

Acushnet Cedar Swamp—The Acushnet Cedar Swamp is crossed by an active freight rail line under existing conditions. The reconstruction of these active rail lines would not create a new canopy gap, and would therefore not change the existing forest interior or edge conditions. The only change to bird habitat would be increased train passage.

Vernal Pools

The vernal pool analysis in the DEIS/DEIR sought to quantify the effects of impacts from the South Coast Rail project on vernal pools, vernal pool habitat, and associated upland habitat surrounding vernal pools. The analysis used the GIS coordinates for each vernal pool data point, and used 100 foot and 750 foot circles around each point to determine the extent of adjacent upland habitat and surrounding upland habitat.

The Secretary's Certificate required that the FEIR include an analysis of all vernal pools within 750 feet of either side of the right-of-way for the Stoughton Alternative. The existing MassGIS data layer was combined with all field survey and observation data in order to make a new data layer showing all NHESP certified, potential, and field surveyed vernal pools within 750 feet of either side of the right-of-way.

The original analysis did not attempt to quantify direct impacts to vernal pools themselves; rather, it defined direct impact as "loss of a wetland where a vernal pool occurs." The updated analysis clarifies impacts to vernal pools themselves, as well as habitat surrounding vernal pools. The different areas were defined as follows:

- Impacts to Vernal Pools: Direct impacts (fill) to vernal pools themselves
- Impacts to Vernal Pool Habitat: Impacts to any wetland area within 100 feet of the boundary of a vernal pool, where the pool is within that wetland
- Impacts to Upland Buffer Habitat: Impacts to any undisturbed, natural upland area within 100 feet of the boundary of a vernal pool
- Impacts to Surrounding Upland Habitat: Impacts to any undisturbed, natural upland area between 100 and 750 feet from the boundary of a vernal pool

The limits of each pool were estimated for all vernal pools within the right-of-way and for any pools that had any portion within 100 feet of the Limit of Disturbance (LOD). Since field delineation of every pool within 100 feet of the LOD in the field was not practicable, limits were established by examining aerial photographs and creating polygons in a GIS data layer to represent the boundary of each pool. 100 foot and 750 foot extents were then generated around these polygons, resulting in a larger area of analysis and a more accurate representation of the extent of actual pools, vernal pool habitat, upland buffer habitat, and surrounding upland habitat than simply assuming the pools to be points. Pools farther away from the LOD (i.e., pools that did not have any portion within 100 feet of the LOD) would not receive any direct impacts to either vernal pool habitat or upland buffer habitat from the South Coast Rail project. The GIS point locations were used to generate the 100 foot and 750 foot areas around these pools. Vernal pool habitat was delineated using the MassGIS wetland layer, along with the updated wetland delineations.

Once the 100 foot and 750 foot areas had been generated around each polygon and point, the impacts to each habitat category described above were calculated. Equal treatment has been given to all vernal pools and potential vernal pools within the Project study area, regardless of their certification status. This conservative approach likely includes some areas in the analysis that do not actually function as vernal pools in the landscape. PVPs that were visually inspected and determined not to function as vernal pools during investigations for the DEIR/DEIS were removed from the updated analysis. Impact calculations conservatively include areas on both sides of the right-of-way, even when separated by a section of berm or track, under the assumption that tracks and ballast are somewhat permeable to small animal movement. The majority of impacts, particularly to vernal pool habitat, occur in areas where the tracks are disused or have been

removed altogether, so use of habitat on both sides of the right-of-way is likely in most of the areas that will receive impacts.

Impacts calculated for upland buffer habitat and surrounding upland habitat did not include any areas of existing railbed or the surrounding ballast. The extent of ballast was not delineated in the field, but an approximation was made for the analysis by using a measurement of 10 feet to either side of the track centerline. Impacts to areas of upland buffer habitat and surrounding upland habitat also did not include any existing developed areas, including buildings and parking areas. Developed areas were estimated by using a land use data layer in the GIS analysis and subtracting any areas of development from impacted areas.

The impacts to vernal pools, vernal pool habitat, upland buffer habitat, and surrounding upland habitat are discussed in detail in this section. Impacts to vernal pools, as well as impacts all associated habitats for the Stoughton Alternative are shown in Figures 4.14-7, 4.14-8 and 4.14-9.

Impacts to Vernal Pools—The most ecologically important impacts are to vernal pools that would be directly filled, resulting in a permanent alteration of the pool. The total fill to vernal pools would be 0.53 acre, or 23,158 square feet, and would affect 19 vernal pools. Table 4.14-12 describes the impacts to vernal pools along the Stoughton Alternative project corridor.

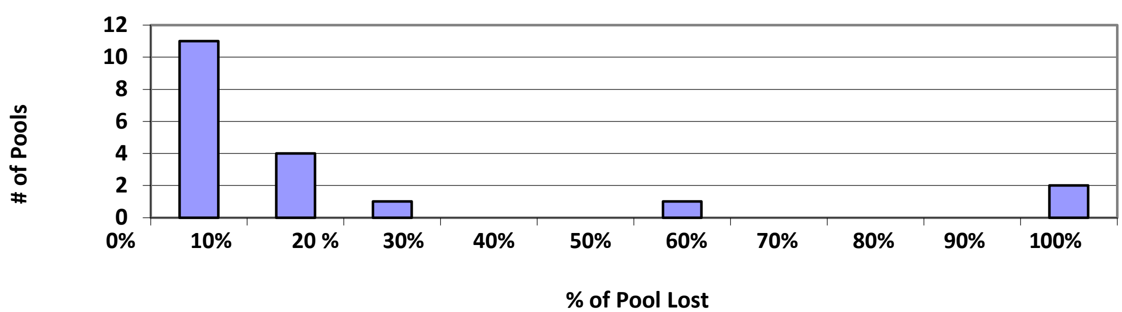
Average depths were not calculated for each of the above pools, so the total volume of fill to vernal pools is not known. The amount of filled surface area in square feet gives an approximate measure of the relative size of disturbance to any given pool. Two vernal pools lie completely (or nearly so) in abandoned sections of the rail bed: PVP 20230 in Raynham and VP 13 in Taunton (Figure 4.14-7e). PVP 20230 would be filled completely, while VP 13 would be filled 96.4 percent, essentially a complete loss. One other pool, PVP 8286 in Freetown, would have a majority (59.8 percent) of its area filled (Figure 4.14-9b). The impacts to the other pools that would be directly affected range from 1.1 percent to 21.3 percent. Easton has the largest number of pools that would be directly affected (6 pools), while Freetown has the largest amount of fill proposed (10,065 SF). While it is impossible to avoid impacting vernal pools to some degree along the Stoughton Alternative, no direct filling would occur to any vernal pools in Canton, Berkley, Lakeville, New Bedford, or Fall River.

Figure 4.14-17 shows the distribution of the percentage impacts to vernal pools. Of the 19 vernal pools that are impacted, 11 pools would lose up to 10 percent or less of their total area, and 15 pools would lose 20 percent or less of their total area.

Table 4.14-12 Impacts to Vernal Pools of the Stoughton Electric Alternative

Municipality	Pools Affected	Amount of Fill (SF)	Approx. Size of Pool (SF)	Approx. Size of Pool (Ac.)	Percent of Pool Filled
Stoughton	PVP 23791	1,480	8,579	0.20	17.2%
Stoughton Total	1	1,480	8,579	0.20	
Easton	PVP 7222	2,197	10,324	0.24	21.3%
	VP-10	112	2,373	0.05	4.7%
	EA-2	661	28,403	0.65	2.3%
	CVP 1462	105	5,589	0.13	1.9%
	NCVP-2	553	50,486	1.16	1.1%
	CVP 1463	292	19,148	0.44	1.5%
Easton Total	6	3,920	116,323	2.67	
Raynham	CVP 1972	660	34,289	0.79	1.9%
	CVP 1971	416	5,816	0.13	7.1%
	PVP 20231	262	4,152	0.10	6.3%
	PVP 20230	418	418	0.01	100.0%
	PVP 20235	1,397	7,652	0.18	18.3%
Raynham Total	5	3,153	52,327	1.21	
Taunton	VP-13	3,323	3,345	0.08	96.4%
	PVP 25089	232	7,009	0.16	3.3%
	PVP 25090	482	7,581	0.17	6.4%
	PVP 25092	503	3,735	0.09	13.5%
Taunton Total	4	4,540	21,670	0.50	
Freetown	PVP 8324	4,470	53,142	1.22	8.4%
	PVP 8284	873	4,940	0.11	17.7%
	PVP 8286	4,722	7,900	0.18	59.8%
Freetown Total	3	10,065	65,982	1.51	
Totals	19	23,158 (0.53 Ac.)			

Figure 4.14-17 Percent Impacts to Vernal Pools Stoughton Electric Alternative



These results are based on preliminary design. In the final design phase of the project, additional small impacts may be avoided or minimized through different grading (for example, steepened slopes along the rail line). Additional design efforts would attempt to minimize impacts. These efforts are discussed in more detail in Section 4.14.3.6.

Impacts to Vernal Pool Habitat—Impacts to vernal pool habitat are defined as impacts to any wetland containing a vernal pool within 100 feet of the boundary of a vernal pool. The loss of vernal pool habitat would affect 40 vernal pools.

Table 4.14-13 describes the impacts to vernal pool habitat along the South Coast Rail project corridor. Where pools are in close proximity to one another, the impacted areas of vernal pool habitat overlap. In these cases, the impacts to the affected area of vernal pool habitat are identified as a whole, and the pools that make up each affected area are denoted. As a conservative measure, the entire area of the Hockomock Swamp under the proposed trestle in Easton was included in the calculation of total vernal pool habitat, since this entire area is known to provide good habitat for vernal pool amphibians. No impacts to vernal pool habitat would occur in the area under the trestle.

Table 4.14-13 Impacts to Vernal Pool Habitat of the Stoughton Electric Alternative

Municipality	Pools Affected	Area of Impact to VP Habitat (SF)	Total Area of VP Habitat (SF)	Total Area of VP Habitat (Ac.)	Percent of VP Habitat Impacted
Stoughton	PVP 23791	166	20,488	0.47	0.8%
	CVP 2140	244	21,802	0.50	1.1%
Stoughton Total	2	410			
	PVP 7222 CVP 2152	949	59,472	1.37	1.6%
	PVP 7218	189	52,039	1.19	0.4%
	CVP 2377 VP-11	325	56,239	1.29	0.6%
	EA-1 EA-2	1,791	89,117	2.05	2.0%
	CVP 1463	3,151	86,590	1.99	3.6%
	PVP 7255 PVP 7256	373	116,929	2.68	0.3%
Easton	CVP 1665 NHESP 2 CVP 1710	819	42,611	0.98	1.9%
Easton Total	13	7,597			
	VP-12	1,965	40,667	0.93	4.8%
	CVP 1972 CVP 1971	1,073	24,615	0.57	4.4%
	PVP 20231	4,239	45,086	1.04	9.4%
	PVP 20230	2,440	20,445	0.47	11.9%
Raynham	PVP 20235	5,446	27,365	0.63	19.9%

Municipality	Pools Affected	Area of Impact to VP Habitat (SF)	Total Area of VP Habitat (SF)	Total Area of VP Habitat (Ac.)	Percent of VP Habitat Impacted
Raynham Total	6	15,163			
	VP-13	3,675	7,722	0.18	47.6%
	PVP 25087	5,237	5,237	0.12	100.0%
	PVP 25089				
	PVP 25090				
	PVP 25092	2,746	88,956	2.04	3.1%
	PVP 25270	894	15,858	0.36	5.6%
	PVP 25271	1,162	40,851	0.94	2.8%
	PVP 25303	1,860	81,817	1.88	2.3%
	PVP 25306				
	PVP 25302	2,197	224,848	5.16	1.0%
	PVP 25314	369	4,967	0.11	7.4%
Taunton	PVP 25317	4,333	17,388	0.40	24.9%
Taunton Total	12	22,473			
	PVP 2320	6,495	129,756	2.98	5.0%
Berkley	PVP 2353	2,228	15,849	0.36	14.1%
Berkley Total	2	8,723			
	PVP 8348	185	67,952	1.56	0.3%
	PVP 8324	4,517	80,935	1.86	5.6%
	PVP 8326	822	12,515	0.29	6.6%
Freetown	PVP 8286	1,302	13,391	0.31	9.7%
Freetown Total	4	6,826			
New Bedford	CVP 2647	1,289	36,463	0.84	3.5%
New Bedford Total	1	1,289			
Totals	40	62,481			

A total of 30 areas would be impacted, affecting a total of 40 vernal pools. The largest impact to vernal pool habitat around any single pool would be to that of PVP 25087 in Taunton (Figure 4.14-7e), which would lose 100 percent of its vernal pool habitat. This vernal pool is a small pool surrounded mainly by upland areas, with all nearby wetlands lying entirely in the right-of-way. Although there are no other wetland areas contiguous to PVP 25087, a large wetland area of wetlands lies less than 200 feet to the east, giving this pool additional wetland habitat nearby. VP 13 would lose 26.4 percent of its vernal pool habitat; however, since this is one of the two pools that would be filled in completely, the loss of additional vernal pool habitat is moot. The impacts to the other pools and habitats that would be directly affected range from 0.3 percent to 24.9 percent. Easton has the largest number of pools that would be affected (13 pools), while Taunton has the largest amount of fill proposed (22,473 SF). While it is impossible to avoid impacting vernal pool habitat to some degree along the Stoughton Alternative, no impacts to vernal pool habitat would occur in Canton, Lakeville, or Fall River. Additionally, Stoughton and New Bedford would experience impact to vernal pool habitat associated with either one or two pools, totaling less than 500 SF in Stoughton and less than 1,300 SF in New Bedford.

Figure 4.14-18 shows the distribution of the percentage impacts to vernal pool habitat. Of the 30 areas impacted, 24 would lose 10 percent or less of their total vernal pool habitat, and 27 would lose 20 percent or less of their total vernal pool habitat.

Impacts to Upland Buffer Habitat—Impacts to upland buffer habitat are defined as impacts to any naturally-vegetated upland area within 100 feet of the boundary of a vernal pool. The loss of upland buffer habitat would affect 60 vernal pools. Table 4.14-14 describes the impacts to upland buffer habitat along the South Coast Rail project corridor. Where pools are in close proximity to one another, the impacted areas of upland buffer habitat overlap. In these cases, the analysis identifies the impacts to the affected area of upland buffer habitat as a whole, and denotes which pools make up each affected area. Impacts are calculated for the loss of undeveloped land with natural vegetation that could provide non-breeding and/or migratory habitat for vernal pool amphibians. Therefore impacts calculated to upland buffer habitat did not include any areas of existing rail bed or the surrounding ballast, which were estimated by using a measurement of 10 feet to either side of the track centerline. Impacts to and total areas of upland buffer habitat also did not include any existing developed areas, including buildings and parking areas. Developed areas were estimated by using a land use data layer in the GIS analysis and subtracting any areas of development from impacted areas. No impacts to upland buffer habitat would occur in the area under the proposed trestle in Easton.

Figure 4.14-18 Percent Impacts to Vernal Pool Habitat Stoughton Electric Alternative

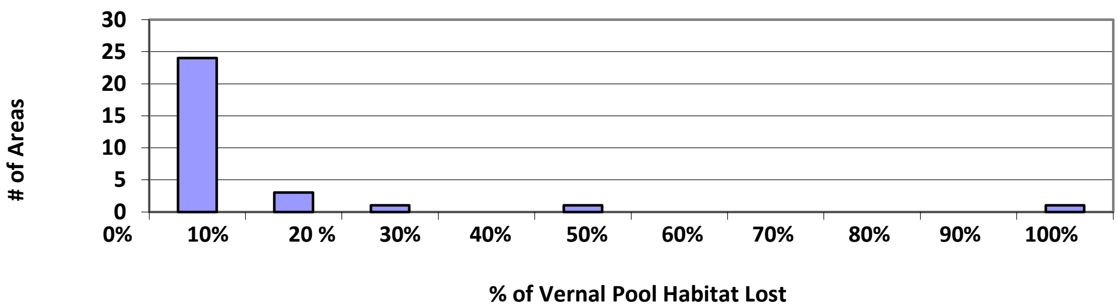


Table 4.14-14 Impacts to Upland Buffer Habitat of the Stoughton Electric Alternative

Municipality	Pools Affected	Area of Impact to Buffer Habitat (SF)	Area of Impact to Buffer Habitat (Ac.)	Total Area of Buffer Habitat (SF)	Total Area of Buffer Habitat (Ac.)	Percent of Buffer Habitat Impacted
	PVP 23791	3,773	0.09	30,166	0.69	12.5%
Stoughton	PVP 23784	24,986	0.57	129,503	2.97	19.3%
	CVP 2140	21,393	0.49	103,765	2.38	20.6%
Stoughton Total	3	50,152	1.15			
	PVP 7222 CVP 2152 VP-10 VP-3	51,658	1.19	192,509	4.42	26.8%
Easton	PVP 7218	12,024	0.28	120,591	2.77	10.0%

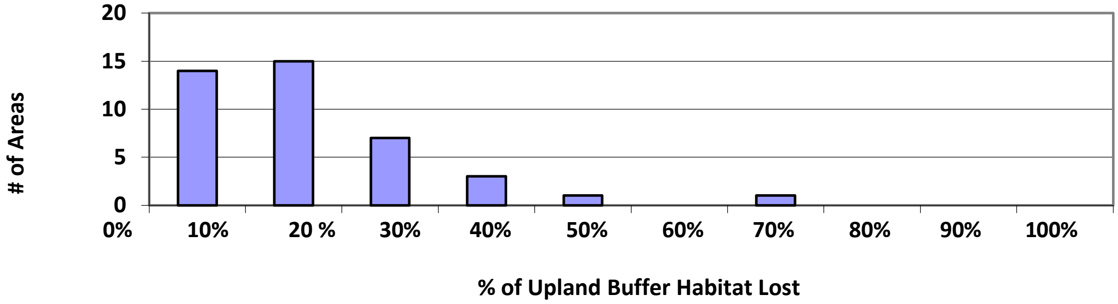
Municipality	Pools Affected	Area of Impact to Buffer Habitat (SF)	Area of Impact to Buffer Habitat (Ac.)	Total Area of Buffer Habitat (SF)	Total Area of Buffer Habitat (Ac.)	Percent of Buffer Habitat Impacted
	VP-6	12,348	0.28	35,510	0.82	34.8%
	CVP 2377 VP-11 VP-7	17,797	0.41	123,093	2.83	14.5%
	EA-1 EA-2	12,133	0.28	129,186	2.97	9.4%
	CVP 1462 NCVP-3	16,973	0.39	127,139	2.92	13.3%
	NCVP-2	17,764	0.41	66,665	1.53	26.6%
	CVP 1463	11,386	0.26	28,116	0.65	40.5%
	PVP 7255 PVP 7256	12,068	0.28	107,474	2.47	11.2%
	NHESP 1	12,684	0.29	55,629	1.28	22.8%
	CVP 1712	4,136	0.09	49,627	1.14	8.3%
	CVP 1665 NHESP 2 CVP 1710	11,036	0.25	91,827	2.11	12.0%
Easton Total	22	192,006	4.41			
	NHESP 3	4,679	0.11	6,991	0.16	66.9%
	PVP 20158	8,947	0.21	27,104	0.62	33.0%
	VP-12	4,266	0.10	31,587	0.73	13.5%
	CVP 1972 CVP 1971	17,580	0.40	74,925	1.72	23.5%
	PVP 20231	7,288	0.17	113,818	2.61	6.4%
	PVP 20230	4,919	0.11	14,462	0.33	34.0%
Raynham	PVP 20235	6,986	0.16	43,386	1.00	16.1%
Raynham Total	8	54,665	1.25			
	VP-13	5,241	0.12	40,951	0.94	12.8%
	PVP 25087	10,130	0.23	52,366	1.20	19.3%
	PVP 25089 PVP 25090 PVP 25092	16,916	0.39	144,958	3.33	11.7%
	PVP 25270	3,189	0.07	39,561	0.91	8.1%
	PVP 25271	652	0.01	46,707	1.07	1.4%
	PVP 25303	2,853	0.07	40,708	0.93	7.0%
	PVP 25306 PVP 25302	2,462	0.06	16,122	0.37	15.3%
Taunton	PVP 25317 PVP 25316	1,288	0.03	97,900	2.25	1.3%
Taunton Total	12	42,731	0.98			

Municipality	Pools Affected	Area of Impact to Buffer Habitat (SF)	Area of Impact to Buffer Habitat (Ac.)	Total Area of Buffer Habitat (SF)	Total Area of Buffer Habitat (Ac.)	Percent of Buffer Habitat Impacted
	PVP 2318					
	PVP 2319	18,684	0.43	75,118	1.72	24.9%
	PVP 2320	8,653	0.20	36,558	0.84	23.7%
Berkley	PVP 2353	2,367	0.05	37,870	0.87	6.3%
Berkley Total	4	29,704	0.68			
Lakeville	PVP 11932	5,557	0.13	237,065	5.44	2.3%
Lakeville Total	1	5,557	0.13			
	PVP 8348	1,717	0.04	18,615	0.43	9.2%
	PVP 8324	1,191	0.03	37,652	0.86	3.2%
	PVP 8326	969	0.02	21,773	0.50	4.5%
Freetown	PVP 8308	5,793	0.13	47,416	1.09	12.2%
	PVP 8284	6,500	0.15	47,444	1.09	13.7%
	PVP 8286	11,045	0.25	69,954	1.61	15.8%
Freetown Total	6	27,215	0.62			
New Bedford	CVP 2647	1,448	0.03	22,081	0.51	6.6%
New Bedford Total	1	1,448	0.03			
Totals	57	403,478	9.26			

A total of 41 areas would be impacted, affecting a total of 57 vernal pools. Impacts to upland buffer habitat would be generally larger than impacts to vernal pool habitat, both in terms of area in square feet and in terms of percentage of available upland buffer habitat associated with each vernal pool or cluster of pools. The majority of impact associated with constructing new tracks and widening existing tracks and berms involves existing uplands. The percentage impacts to upland buffer habitat are therefore greatest in areas where this type of habitat is limited to berms and slopes along large wetlands or wetland complexes. For example, the largest percentage impact to upland buffer habitat is at NHESP 3 in Raynham (Figure 4.14-7d), which would lose 66.9 percent of its upland buffer habitat. The nearby pool of PVP 20158 is approximately the same distance from the limit of disturbance as NHESP 3, but would lose only 33.0 percent of its upland buffer habitat. This lower percentage is due to the fact that PVP 20158 has additional upland area within 100 feet of the boundary of the pool, whereas the upland area within 100 feet of the boundary of NHESP 3 is mainly limited to the railroad berm.

Figure 4.14-19 shows the distribution of the percentage impacts to upland buffer habitat. Of the 41 areas impacted, 14 would lose 10 percent or less of their total upland buffer habitat, and 29 would lose 20 percent or less of their total upland buffer habitat. Twelve areas would lose more than 20 percent of their total upland buffer habitat. While impacts to upland buffer habitat can affect the ability of vernal pools to sustain viable populations, all affected pools have additional upland buffer habitat or surrounding upland habitat contiguous to their impacted upland buffer habitat, with the exception of pool NHESP 3.

Figure 4.14-19 Percent Impacts to Upland Buffer Habitat Stoughton Electric Alternative



Impacts to Surrounding Upland Habitat

Impacts to surrounding upland habitat are defined as impacts to any naturally vegetated upland area between 100 and 750 feet of the boundary of a vernal pool. For these pools, point locations were used to represent each pool. The loss of surrounding upland habitat would affect 147 vernal pools. Table 4.14-15 lists the impacts to surrounding upland habitat along the South Coast Rail project corridor. Where pools are in close proximity to one another, the impacted areas of buffer habitat overlap. In these cases, the impacts to the affected area of surrounding upland habitat are identified as a whole, and the pools that make up each affected area are denoted. Impacts are calculated for the loss of undeveloped land with natural vegetation that could provide non-breeding and/or migratory habitat for vernal pool amphibians. The impacts calculated for surrounding upland habitat did not include any areas of existing rail bed or the surrounding ballast, which were estimated by using a measurement of 10 feet to either side of the track centerline. Impacts to and total areas of surrounding upland habitat also did not include any existing developed areas, including buildings and parking areas. Developed areas were estimated by using a land use data layer in the GIS analysis and subtracting any areas of development from impacted areas. No impacts to surrounding upland habitat would occur in the area under the proposed trestle in Easton. For a single pool surrounded by completely undeveloped area, the total potential surrounding upland habitat would be over 40 acres.

Table 4.14-15 Impacts to Surrounding Upland Habitat of the Stoughton Electric Alternative

	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 23791	0.63	10.42	6.0%
	PVP 23778	1.72	35.57	4.8%
Stoughton	PVP 23784 CVP 2140	8.63	54.45	15.9%
Stoughton Total	4	10.98		
Easton	PVP 7222 CVP 2152 VP-10 VP-3 PVP 7218 VP-6 CVP 2377	4.15	66.10	6.3%

	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	VP-11			
	VP-7			
	PVP 7220			
	PVP 7221			
	PVP 7219			
	CVP 2153			
	CVP 2154			
	PVP 7223			
	VP 2			
	VP 4			
	CVP 1827	0.19	16.37	1.2%
	EA-1			
	EA-2			
	CVP 1462			
	NCVP-3			
	NCVP-2			
	PVP 7242			
	CVP 1463	1.39	48.56	2.9%
	PVP 7255			
	PVP 7256			
	PVP 7254			
	PVP 7324			
	PVP 7257			
	PVP 7325	1.60	46.42	3.4%
	NHESP 1	0.61	10.69	5.7%
	CVP 1712			
	CVP 1665			
	NHESP 2			
	CVP 1710	1.57	60.97	2.6%
Easton Total	36	9.50		
	PVP 20158			
	NHESP 3	0.75	4.55	16.4%
	PVP 20178			
	PVP 20179			
	PVP 20181			
	PVP 20182	1.99	56.30	3.5%
	PVP 20186			
	PVP 20189	0.40	33.67	1.2%
	PVP 20193	0.70	17.30	4.1%
	VP-12			
	PVP 20198			
Raynham	PVP 20197	2.11	96.90	2.2%

	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 20195			
	PVP 20196			
	PVP 20208			
	PVP 20209			
	PVP 20210			
	PVP 20211			
	PVP 20214			
	PVP 20215			
	CVP 1972			
	CVP 1971			
	PVP 20231			
	PVP 20233			
	PVP 20232			
	PVP 20230			
	PVP 20235	0.78	34.77	2.2%
Raynham Total	27	6.72		
	VP-13			
	PVP 25087			
	PVP 25099			
	PVP 25091			
	PVP 25090			
	PVP 25098			
	PVP 25097			
	PVP 25089			
	PVP 25096			
	PVP 25095			
	PVP 25092			
	PVP 25094			
	PVP 25093			
	PVP 25109	0.85	83.62	1.0%
	PVP 25270			
	PVP 25271			
	PVP 25278			
	PVP 25295			
	PVP 25294	0.84	74.97	1.1%
	PVP 25303			
	PVP 25302			
	PVP 25304			
	PVP 25305			
	PVP 25306			
	PVP 25308			
	PVP 25307			
Taunton	PVP 25309	0.38	21.36	1.8%

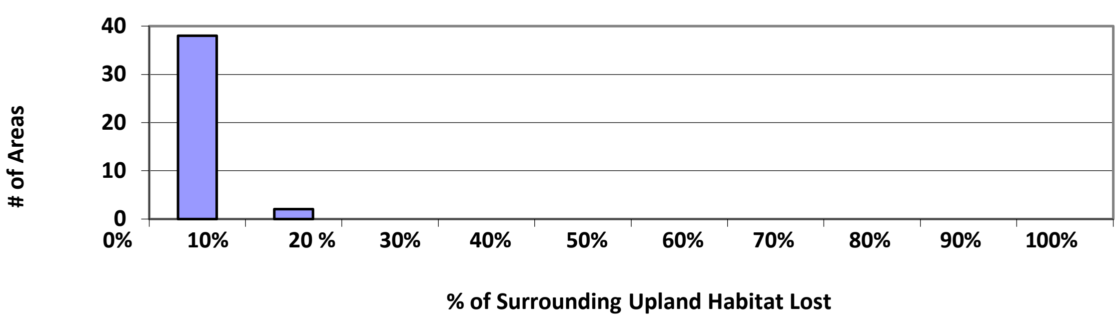
	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 25310			
	PVP 25317			
	PVP 25316			
	PVP 25315			
	PVP 25318	0.58	47.67	1.2%
	PVP 25395			
	PVP 25397	1.29	32.96	3.9%
Taunton Total	34	3.93		
	PVP 2316	0.83	21.67	3.8%
	PVP 2318			
	PVP 2319			
	PVP 2320			
	PVP 2317	1.60	62.16	2.6%
	PVP 2353	0.39	18.49	2.1%
	PVP 2354			
	PVP 2356			
	PVP 2358	0.46	31.14	1.5%
	PVP 2360	0.96	15.39	6.3%
Berkley	PVP 2361	0.02	13.79	0.1%
Berkley Total	11	4.26		
	PVP 11932	0.38	18.88	2.0%
	PVP 11931	0.20	24.75	0.8%
Lakeville	PVP 11883	0.12	8.93	1.4%
Lakeville Total	3	0.70		
	PVP 8348	0.42	14.07	3.0%
	PVP 8362	0.33	28.17	1.2%
	PVP 8324	0.17	12.42	1.4%
	PVP 8326	0.48	24.56	1.9%
	PVP 8308			
	PVP 8309			
	PVP 8310	1.34	63.30	2.1%
Freetown	PVP 8312			
	PVP 8313	0.46	29.68	1.6%
	PVP 8284			
	PVP 8286			
	PVP 8283			
	PVP 8285			
	PVP 8287	3.05	55.18	5.5%
Freetown Total	14	6.26		
	CVP 1892			
	CVP 1893	0.23	34.01	0.7%
New Bedford	CVP 2647	0.28	18.42	1.5%

	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 15554			
	CVP 2525	0.29	26.71	1.1%
	PVP 15571			
	PVP 15572	0.26	35.64	0.7%
New Bedford Total	7	1.06		
Totals	136	43.40		

A total of 40 areas would be impacted, affecting a total of 136 vernal pools. While impacts to surrounding upland habitat are larger in terms of size than either vernal pool habitat or upland buffer habitat, the overall impacts would be negligible. The large total area of surrounding upland habitat around a given pool, or more often a cluster of pools, tends to ameliorate the impacts to surrounding upland habitat in any one area. The largest percentage impact to surrounding upland habitat is around the pair of pools PVP 20158 and NHESP 3 in Raynham (Figure 4.14-7d), which would lose 16.4 percent of their surrounding upland habitat. This impact is due to a combination of significant wetland areas surrounding these two pools as well as large developed areas on the eastern side of the right-of-way. The pair of pools PVP 23784 and CVP 2140 in Stoughton (Figure 4.14-7b) would lose 15.9 percent of their surrounding upland habitat from constructing the North Easton station. Impacts to pools already segregated from the right-of-way by an existing road, such as PVP 4291 in Canton (Figure 4.14-7a), are unlikely to have any real effect on the pool in question. Conversely, in areas such as that around the pair of pools PVP 23778 and PVP 23779 in Stoughton (Figure 4.14-7b), impacts are more likely to exclusively affect PVP 23778 due to the separation of PVP 23779 from the right-of-way, again by an existing roadway. Still, the overall effects to either pool would be very small since both have a large contiguous area of surrounding upland habitat around the pool. There are no pools or cluster of pools along the length of the Stoughton Alternative corridor that would have a large percentage of surrounding upland habitat impacted.

Figure 4.14-20 shows the distribution of the percentage impacts to surrounding upland habitat. Of the 40 areas impacted, 38 would lose 10 percent or less of their total surrounding upland habitat, and all 40 would lose less than 20 percent of their total surrounding upland habitat.

Figure 4.14-20 Percent Impacts to Surrounding Upland Habitat Stoughton Electric Alternative



Fragmentation Effects

Habitat fragmentation can occur to individual pools as well areas with multiple pools, and can affect the species that use vernal pools by restricting or cutting off their access to vernal pool habitat, upland buffer habitat, and surrounding upland habitat.

Fragmentation of individual pools would occur when a given pool has a large area of an associated habitat on the opposite side of the tracks, and little to no associated habitat on the same side of the tracks. Most often the habitat on the same side of the tracks is either cut off by existing roadways or is developed with structures or parking areas. For these pools, the vernal pool amphibians that use the pool will spend the majority of the year in the more naturally vegetated areas on the opposite side of the tracks, crossing over to use the pool during breeding season. Constructing new tracks, widening berms, and constructing steeper slopes and retaining walls can all separate vernal pool amphibians from their necessary breeding habitat, thereby reducing the effectiveness of the pool. Along the Stoughton Alternative corridor, the only vernal pool that would experience these effects to is NHESP 3 in Raynham (Figure 4.14-7d). This pool at the southern end of the Hockomock Swamp past the end of the trestle, and is part of the large Hockomock wetland complex. Constructing the railroad would impact the majority of the upland buffer habitat of this pool, and the majority of the surrounding area is wetland. The small amount of undeveloped upland buffer habitat across the existing berm would be cut off from NHESP 3. No other pools have any of their associated habitats cut off from the South Coast Rail project. The majority of pools occur in less developed areas, and have contiguous additional vernal pool habitat, upland buffer habitat, and surrounding upland habitat available to vernal pool amphibians that use the pools. Even pools in more densely developed areas are either already separated from the right-of-way by an existing road (such as PVP 4291 in Canton, Figure 4.14-7a), or would not experience separation of the pool from additional areas of associated habitats by constructing the railroad.

Larger-scale fragmentation effects can occur in areas with multiple pools. These areas may have pools separated from one another due to fragmentation from the new railway. New tracks, track widening, steepened slopes, and retaining walls can all create significant barriers to animal movement between pools, where before the barrier effects of the abandoned railroad bed may have been only moderate or minimal. This can affect the health of the entire pair, cluster, or system of pools by preventing animal movement between them. Table 4.14-16 highlights areas where pools are likely to be separated from one another or have their current level of separation increased. Pairs or clusters of pools where fragmentation occurs within 100 feet represent more tightly associated pools. Pools already separated by existing roadways or other developed areas that provide barriers to movement were not considered.

New fragmentation effects would occur entirely in Easton, Raynham, and Taunton. One additional cluster in Freetown already has PVP 8283 separated from PVPs 8284, 8285, 8286, and 8287 (Figure 4.14-9b) by an existing maintained railway, so additional fragmentation effects are unlikely. Separating pools from one another can decrease the amount of associated vernal pool habitat, upland buffer habitat, and supporting upland habitat available to all pools in the cluster or pair. This can affect species density and the ability of the pool to provide adequate breeding habitat, if the majority of the organisms that use the pool originate from the other side of the railroad. Fragmentation is likely to have the largest effects in cases where one pool is newly separated from a cluster, or where a pair of pools is separated to create two single pools, and when the pools are close together (i.e., within 100 feet of one another). This would occur, for example, in Easton, where VP-3 is separated from a cluster of four other pools (Figure 4.14-7b). In the areas of fragmentation listed in Table 4.14-16, there are no cases where one pool is separated from a pair or cluster without at least some extant surrounding habitat of its own.

Table 4.14-16 Fragmentation Effects of the Stoughton Electric Alternative

Municipality	Pools on Western Side of ROW	Pools on Eastern Side of ROW	Fragmentation occurs within 100 feet	Fragmentation occurs within 750 feet
		PVP 7222		
		CVP 2152		
		PVP 7223		
	VP-3	VP-10	X	
	PVP 7219	CVP 2154		
	PVP 7218	VP-7		
	CVP 2153	CVP 2377		X
		VP-7		
	VP-11	CVP 2377	X	
	EA-1	EA-2	X	
	CVP 1462	NCVP-3	X	
	PVP 7255	PVP 7256	X	
		PVP 7234		
Easton	PVP 7255	PVP 7257		X
	PVP 20181			
	PVP 20179			
	PVP 20182	PVP 20178		X
		PVP 20209		
		VP-12		
	PVP 20208	PVP 20210		X
Raynham	CVP 1971	CVP 1972	X	
	PVP 20235	PVP 25087		X
	PVP 25090			
	PVP 25089			
	PVP 25092	PVP 25096	X	
		PVP 25099		
		PVP 25098		
	PVP 25091	PVP 25097		
	PVP 25090	PVP 25095		
	PVP 25089	PVP 25096		
	PVP 25092	PVP 25094		X
	PVP 25318			
	PVP 25317			
Taunton	PVP 25316	PVP 25315		X

Summary of Impacts

Table 4.14-17 provides a summary of the impacts to vernal pools and surrounding habitat of the Stoughton Electric Alternative. The majority of impacts to vernal pools occur on the Stoughton Line. The Stoughton line contains 16 of the 19 pools that would experience direct impact (fill) from the Project, 28 of the 40 pools that

would experience impacts to vernal pool habitat, 42 of the 57 pools that would experience impacts to upland buffer habitat, and 88 of the 136 pools that would experience impacts to surrounding upland habitat.

Table 4.14-17 Summary of Vernal Pool Impacts of the Stoughton Electric Alternative

Pools with Direct Fill / Amount of Fill	Pools with Impacts to Vernal Pool Habitat	Pools with Impacts to Buffer Habitat	Pools with Impacts to Surrounding Upland Habitat
19 / 0.53 Ac.	40 / 1.43 Ac.	57 / 9.29 Ac.	136 / 43.40 Ac

The following points summarize the impacts by municipality.

- Canton: There are no impacts in Canton. The one vernal pool within 750 feet of the right-of-way is already separated from the right-of-way by an existing roadway.

- Stoughton: Impacts in Stoughton are small. One pool (PVP 23791) would receive direct fill but has large contiguous areas of adjacent vernal pool habitat, upland buffer habitat, and surrounding upland habitat around it. No clusters of pools are present.

- Easton: Six pools would receive direct fill in Easton, although only one (PVP 7222) would lose greater than 20 percent of its area. While upland buffer habitat within 100 feet would be impacted around several pools, in all cases these pools have additional surrounding upland habitat between 100 and 750 feet away. Several clusters and pairs of pools are in close proximity to the right-of-way and would experience fragmentation both of associated habitats and of entire pools from one another. The majority of these clusters and pairs are in close association with one another (i.e., pools are within 100 feet of each other or within 100 feet of another pool in the same cluster).

- Raynham: One pool (PVP 20230) would be completely filled for the project, resulting in a loss of the pool as well as the utility of its associated habitats. Five other pools would also receive direct fill. One pool (NHESP 3) would lose upland buffer habitat and does not have contiguous adjacent upland habitat nearby. Two clusters of pools would experience fragmentation within 750 feet, plus an additional pair of pools which would experience fragmentation within 100 feet.

- Taunton: One pool (VP 13) would be filled 96.4 percent, essentially a complete loss. Four additional pools would receive direct impact. In addition, Taunton has some of the largest impacts to both vernal pool habitat and upland buffer habitat. However, in all cases these pools have additional habitat between 100 and 750 feet away. Taunton also has several clusters of pools that would experience fragmentation within 750 feet, and one cluster within 100 feet.

- Berkley: Impacts in Berkley would be small. No pools would receive direct fill, and impacts to vernal pool habitat are small. Impacts to upland buffer habitat, particularly around PVP 2318 and PVP 2319 are more significant, but these pools have additional surrounding upland habitat. No cases of fragmentation between pools occur in Berkley.

- Lakeville: Impacts in Lakeville are very small. Few vernal pools exist along the right-of-way and no pools would receive direct fill. Impacts to other associated habitats are also small, and there are no cases of fragmentation between pools.

- Freetown: One pool (PVP 8286) in Freetown would receive fill to a majority of its area, and would also receive an impact greater than 25 percent to both vernal pool habitat and upland buffer habitat. The nearby pool of PVP 8284 would also receive direct fill as well as impacts to vernal pool habitat and upland buffer habitat. In both cases these pools have additional habitat between 100 and 750 feet away. The remainder of the pools in Freetown do not receive large impacts.

- New Bedford: Impacts in New Bedford would be very small. Few pools exist along the right-of-way. No pools would receive direct impacts, and impacts to other associated habitats are small, with exception of one large impact to the upland buffer habitat of CVP 2647. However this pool has large unfragmented areas of additional surrounding upland habitat.

- Fall River: There are no impacts in Fall River.

Overall, impacts to vernal pools along the South Coast Rail project corridor are small and are not likely to compromise the functions of pools or communities of pools along the route. Two vernal pools would be filled completely (PVP 20230 in Raynham and VP 13 in Taunton, Figure 4.14-7e), and one additional pool would lose a majority of its area (PVP 8286 in Freetown, Figure 4.14-9b). Of the remaining pools, no pool or group of pools would lose a large portion of its vernal pool habitat, upland buffer habitat or supporting upland habitat. Additionally, pools that lose areas of associated habitats have additional, larger contiguous areas of these habitats adjacent to them, with the exception of NHESP 3 in Raynham (Figure 4.14-7d).

Appendix 4.14-C shows the impacts to vernal pools that would be directly filled, along with the impacts to all associated habitats: vernal pool habitat, buffer habitat, and surrounding upland habitat. Where pools are in close proximity to one another, the impacted areas of habitat will overlap; a given habitat area can therefore have impacts from multiple pools. The table shows the impacts to each habitat area as a whole. Where multiple pools contribute to an affected area, the number of pools associated with each given habitat area are given.

Fish and Wildlife Passage

This part discusses fish and wildlife crossings. Culverts and bridges along the South Coast Rail Stoughton Alternative alignment are described and a plan for providing crossings in areas with high biodiversity value to enhance fish and wildlife passage is provided.

A detailed inventory of bridges and culverts was conducted to identify the location, condition, and function of each structure. Dimensions, construction materials, and railroad bed characteristics (such as condition and depth of cover) were recorded. For this biodiversity assessment, the subset of bridges and culverts with potential ecological value was determined by reviewing wetland mapping (as depicted in the Abbreviated Notice of Resource Area Determination [ANRAD] for each municipality), surrounding land use (as visible in aerial photographs), and other ecological setting features (as modeled by CAPS[67])

[67] UMass Extension. 2011. CAPS Index of Ecological Integrity. http://umasscaps.org/. The CAPS model output indicates areas with a high (over 50 percent) Index of Ecological Integrity (IEI). CAPS maps for each town along the Stoughton Alternative are provided in Appendix C.

of the complete bridge and culvert inventory. The inventory of this subset of bridges and culverts is provided in Appendix 4.14-A and summarized in this section.

There are 128 structures (23 bridges and 105 culverts) along the Stoughton Alternative alignment (comprised of the Stoughton Line, New Bedford Main Line, and Fall River Secondary) that may have biodiversity value by connecting ecosystems, which can allow fish and wildlife to pass from one side of the tracks to the other. Many of these structures also have a hydrologic function, allowing water to flow under or through the railroad structure (subgrade, ballast, ties, and tracks). Bridges that convey roads under or over the railroad bed will also be improved for the project but do not have an ecological function connecting ecosystems and are therefore not included in this biodiversity evaluation. Bridges and culverts that have been replaced prior to the South Coast Rail project are also not included in this biodiversity evaluation, as are 29 culverts within the right-of-way that do not cross under the railroad bed (but instead are parallel to it) and therefore do not connect ecosystems bisected by the railroad.

Proposed Bridge and Culvert Replacement

Most of the bridges and culverts along the Stoughton Alternative alignment will be replaced to meet engineering requirements for operation of the South Coast Rail. The track design is conceptual at this stage but takes into consideration operational and safety requirements as well as the gentle elevation change requirements of a fixed guideway transit system. Railroad track elevation changes and curves must be gradual to accommodate the design requirements for a safe high speed train track. Additionally, the railroad bed must meet certain width and depth specifications (depending on the nature of the underlying ground surface) to provide proper track support and ballast drainage. The following sections describe the engineering evaluation of bridges and culverts conducted to support the preliminary design.

Bridges—The 23 existing bridges considered in this biodiversity evaluation are in deteriorating condition and have insufficient capacity for the expected loads and speeds of the South Coast Rail trains. Many of the bridges along the Stoughton Alternative will be replaced to meet current engineering standards for the high-speed commuter rail service, regardless of whether or not the bridges span roads or waterbodies. One new bridge to replace a washed-out culvert, and a new trestle through Hockomock Swamp, will be constructed. Table 4.14-18 describes the proposed substructure for the bridges and trestle that could impact fish and wildlife passage; typical bridge cross-sections for single-span and two-span structures are depicted in Figures 4.14-21a and b, respectively.

Piers or pilings supporting existing multiple-span bridges (see Table 4.14-18) will be replaced by a single pier at the center of a two-span structure, minimizing impacts to stream hydrology and fish habitat. Abutments for most of the bridges will be replaced, offering an opportunity to improve wildlife passage on stream and river banks. Typically, existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center of the span. New cast-in-place concrete abutments would be constructed behind the existing timber crib abutments, which would then be partially removed to an elevation equal to the river’s average seasonal high water elevation.

Table 4.14-18 Proposed Bridge Substructure Construction

Bridge	Figure Number	Proposed Substructure Construction
Stoughton Line		
Forge Pond	4.14-11a	No change to existing abutment location. The new superstructure (above or adjacent to existing historic arch structure) would be supported on adjacent augured piles or drilled shafts.
Mill Brook (Beaver Meadow Brook)	4.14-11a	No change to existing abutment location. The new superstructure (above or adjacent to existing historic arch structure) would be supported on adjacent augured piles or drilled shafts.
Cowessett Brook (Whitman Brook)	4.14-11b	New abutments would be constructed behind existing abutments, which would then be removed.
Quessett Brook (Small Creek)	4.14-11b	Existing stacked stone abutments would be rehabilitated to accommodate increased loads; there would be no change in abutment location.
Black Brook	4.14-11c	New bridge would be constructed to replace washed out culvert. Cast-in-place concrete abutments would be constructed beyond the banks of Black Brook so as to not change the hydrology of the stream or conditions of the surrounding wetlands, and to provide shelves for wildlife passage.
Hockomock Swamp	4.14-11c	New 8,500-foot long trestle over existing rail bed, constructed on steel h-piles or concrete piles at 30-foot intervals.
Pine Swamp Brook #1	4.14-11d	The design for this structure has not yet been determined, but would provide wildlife shelves.
Pine Swamp Brook #2	4.14-11d	The design for this structure has not yet been determined, but would provide wildlife shelves.
Taunton River (@MP 34.38)	4.14-11e	Existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center of the span. New abutments would be constructed behind the existing abutments, which would then be removed.
Taunton River (@MP 34.62)	4.14-11e	Existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center of the span. New abutments would be constructed behind the existing abutments, which would then be removed.
Taunton River (@MP 34.73)	4.14-11e	Existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center of the span. New abutments would be constructed behind the existing abutments, which would then be removed.
Mill River	4.14-11e	New abutments would be constructed behind the existing abutments, which would then be removed.
New Bedford Main Line		
Taunton River (@MP 35.56)	4.14-11e	Existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center of the span. New abutments would be constructed behind the existing abutments, which would then be removed.
Brickyard Road	4.14-11e	Existing stacked stone abutments would be rehabilitated to accommodate increased loads; there would be no change in abutment location.
Cotley River (@MP 38.93)	4.14-12a	New abutments would be constructed behind the existing abutments, which would then be removed.

Bridge	Figure Number	Proposed Substructure Construction
Cotley River (@MP 39.46)	4.14-12a	New abutments would be constructed behind the existing abutments, which would then be removed.
Cedar Swamp River	4.14-12b	New abutments would be constructed behind the existing abutments, which would then be removed.
Fall Brook	4.14-12b	New abutments would be constructed behind the existing abutments, which would then be removed.
Fall River Secondary		
Cedar Swamp River	4.14-13a	Existing piles would be removed and one new concrete pier would be constructed in the center of the span. New abutments would be constructed behind the existing abutments, which would then be removed.
Farm Road	4.14-13b	Existing stacked stone abutments would be rehabilitated to accommodate increased loads; the abutment location would not be changed.
Farm Road	4.14-13b	This bridge will be filled in, as the existing dirt road spanned by the bridge has been abandoned.
Miller's Cove	4.14-13b	New abutments would be constructed to replace the existing stacked stone abutments; the abutment location would not be changed.
Collins Road	4.14-13b	Existing stacked stone abutments would be rehabilitated to accommodate increased loads; the abutment location would not be changed.
Ashley's Underpass	4.14-13b	Existing stacked stone abutments would be rehabilitated to accommodate increased loads; the abutment location would not be changed.
Channel near Battleship Cove	4.14-13c	The design for this structure has not yet been determined.

Culverts—The 105 existing culverts considered in this biodiversity assessment along the three railroad lines range in condition from good to poor, with most performing their hydrologic function but many partially or fully collapsed, buried, or plugged. Depending upon the recommendations made to enhance ecological connections, project requirements, and engineering constraints, these culverts may be replaced, left in place, or abandoned.

From an engineering perspective alone, culvert replacement would be based on a variety of existing conditions or project needs. Culverts that are no longer performing their hydrologic function (e.g., are plugged or collapsed) or that exhibit structural failure would likely be replaced. Culverts that would need to be extended to accommodate a change in the track for the South Coast Rail project, such as relocating the track or installing double tracks where a single track currently exists, would also be replaced. Culverts that are in good condition, are functioning properly, and meet the requirements of the South Coast Rail project, do not require any action.

Other Important Habitat Areas

The Stoughton Alternative also passes the Stoughton Memorial Conservation Lands (including the Bird Sanctuary) north of the proposed North Easton station. The railroad tracks and ties are currently in place through this section, although the canopy has closed over the out-of-service tracks. Restoring the tracks would require removing vegetation along the right-of-way, which would result in a new "edge effect"

that would alter the microhabitat characteristics of wooded areas adjacent to the rail, potentially reducing the ability of this area to support forest interior species.

Indirect Impacts of the Stoughton Electric Alternative

The analysis of indirect impacts evaluates the effects of the Stoughton Electric Alternative on key elements of biodiversity. Where the Stoughton Alternative's impacts on natural communities would occur entirely along the edge of existing active rail lines, indirect impacts to natural communities, wildlife or fisheries are anticipated to be minor and restricted to the edges of these communities. The Stoughton Alternative also has the potential to cause larger indirect effects to natural communities where it would reconstruct an out-of-service rail line, particularly along the Stoughton Line from Foundry Street in Easton to Thrasher Street in Taunton.

Vegetation Management—Right-of-way maintenance is critical to the protection of the tracks and ties and to maintaining railroad safety. Right-of-way maintenance can only be done in accordance with an approved Vegetated Management Plan (VMP) and Yearly Operating Plan (YOP) that have been reviewed by the Massachusetts Department of Food and Agriculture (DFA) and made available for public comment. These management plans are developed in accordance with the DFA's regulations, which prohibit or restrict the application of herbicide in sensitive areas such as close proximity to wetlands and public or private drinking water supplies. Under existing conditions and the No-Action Alternative, CSX Corporation maintains the track from Whittenton Junction to Cotley Junction in Taunton, MassCoastal Railroad maintains the track from Cotley Junction to New Bedford and Fall River, and MBCR maintains the track north of Stoughton Station in accordance with approved VMPs and YOPs.

To protect state-listed species, as well as aquatic organisms and water quality, the applicant has committed to treat the entire portion of the corridor through the Hockomock Swamp (from Foundry Street to the Raynham Park Station) and through Pine Swamp as No-Application sensitive areas. In addition, in accordance with the DFA requirements, the following will be designated as No-Application zones:

- Areas within 10 feet of a surface water or wetland
- Areas within 50 feet of a private drinking water supply
- Areas within 100 feet of a surface water public water supply
- Areas within 400 feet of a public water supply well (Zone 1)

These specific locations will be identified and shown on detailed project plans during the subsequent final design and permitting phase of the project, when a VMP is developed. The 1" = 1250' scale graphics used to depict the Stoughton Alternative for the purposes of the DEIS/DEIR are not sufficiently detailed to allow these areas to be shown.

The vast majority of areas disturbed for construction (extending 14 feet to each side of the track centerline, for a total width of 28 feet for single track and 42 feet for double track) will be surfaced with ballast and will be within the area where vegetation must be managed for railroad safety. These areas will not be allowed to revegetate. Disturbed areas outside of the trackbed would be seeded with an appropriate stabilization seed mix using native species. These seeded areas would be expected to revegetate within one growing season.

Habitat Fragmentation—Comments on the DEIS/DEIR, request that the applicant update the discussion of reference studies regarding habitat fragmentation impacts of linear transportation infrastructure with more recent studies, as available. These comments also suggested that the applicant should consider wildlife habitat evaluations for the portions of the track that will fragment locally important wildlife habitats, and specifically assess the impacts to wildlife movement in the segment of track adjacent to the Acushnet Cedar Swamp.

Important Wildlife Habitats—In November, 2011 the UMass Extension Center for Agriculture, in conjunction with DEP, produced Important Wildlife Habitat maps. These maps are based on the CAPS integrated index of ecological integrity and show the areas in each municipality that fall into the top 40 percent for IEI value.[68] According to the DEP Wildlife Habitat Protection Guidance, these Important Wildlife Habitat polygons are considered Designated Habitat of Potential Regional or Statewide Importance. Wetland impacts, above the regulatory thresholds established in 310 CMR 10.00 for each resource area, may trigger the requirement for detailed wildlife habitat evaluations as described in Appendix B of the DEP Guidance.[69]

The Stoughton Alternative does not cross any Important Wildlife Habitat in Canton, Stoughton, Taunton, New Bedford or Fall River. The alignment crosses Important Wildlife Habitat in the following locations:

- Easton: the Hockomock Swamp south of Foundry Street
- Raynham: the Hockomock Swamp north of the former Raynham Greyhound Park, a small area north of Bridge Street, and the Pine Swamp west of the railroad
- Berkley: the area between Cotley Street and Padelford Street
- Lakeville: along the New Bedford Main Line between Malbone Street and Howland Road (the Assonet Cedar Swamp), and an area south of Howland Road
- Freetown: along the New Bedford Main Line north of Chace Road and a small area between Chace Road and Braley Road

Detailed wildlife habitat evaluations will be required in these areas as part of the subsequent Notice of Intent filings for the Stoughton Alternative, once final design plans have been developed and wetland impacts have been more precisely determined. Such detailed evaluations are not appropriate or feasible at this planning level.

Predation is an indirect effect associated with forest fragmentation, and may increase if opportunist predators such as crows and raccoons move into the edges adjacent to the project alignment. However, the existing railbed is open and used as a trail, so there are likely to be predation-related edge effects under existing conditions. The existing upland berm will not be widened through the Hockomock Swamp, and therefore the possibility that this will be used as a trail by ground predators is not likely to be substantially greater than under existing conditions.

[68] http://www.umass.edu/landeco/research/caps/dep/dep.html, accessed 15 March 2012.
[69] Department of Environmental Protection, Wildlife Habitat Protection Guidance, 2006.

There may also be increased brood-parasitism on songbirds if brown headed cowbirds colonize the edges adjacent to the rail. However, it is unlikely that large numbers of cowbirds will colonize the reconstructed right-of-way because the increase in canopy width is minimal.

Acushnet Cedar Swamp—The active freight railroad passes along the east edge of the Acushnet Cedar Swamp between the New Bedford Industrial Park (Samuel Barnett Boulevard) and Route 140. The land east of the railroad is occupied by the industrial park, a large industrial complex accessed from Welby Road, a residential neighborhood, and Route 140, a divided highway with two travel lanes in each direction. The DEP Important Wildlife Habitat map for New Bedford shows Important Wildlife Habitat only west of the railroad. A wetland (NB-20) is also located east of the railroad, south of the Industrial Park, west of Doreen Street, and north of Route 140. It is connected to Acushnet Cedar Swamp via culverts under the track and the linear channel adjacent to the Industrial Park, also east of (and parallel to) the railroad line. Therefore, this wetland not a part of the mapped DEP Important Wildlife Habitat, but there may be some movement of wetland-dependent wildlife between the Acushnet Cedar Swamp and NB-20, possibly warranting new between-the-tie crossings at this location.

Additional Information on Barrier Effects—A literature search to identify additional scientific studies on the barrier effects of railroads was undertaken, including review of Environmental Impact Statements currently or recently prepared by the FRA.[70] The search did not identify any additional information on the barrier effects of railroads, although one paper suggested that roads and railroads may restrict bumblebee movement, fragmenting both bumblebee populations and also restrict pollen transfer between plant populations.[71]

Noise Impacts to Wildlife—Comments on noise included requests that the project incorporate strategies to minimize noise impacts on wildlife during construction in ecologically sensitive areas, that the FEIS/FEIR provide additional information about noise impacts to wildlife in ecologically sensitive areas, and that additional mitigation measures be identified. In particular, these comments focused on the Acushnet Cedar Swamp in New Bedford, which has been designated as a National Natural Landmark by the National Park Service and which is owned by the Division of Conservation and Recreation as the Acushnet Cedar Swamp State Reservation.

Noise Impacts to Wildlife – National Natural Landmark (NNL) Acushnet Cedar Swamp—In the Acushnet Cedar Swamp section of the New Bedford Main Line, trains are anticipated to be traveling at approximately 100 miles per hour (1.6 miles per minute, 140 feet per second). At this speed, with an 8-car train, it will take a train less than 6 seconds to pass any given spot. The duration of the noise (88 dB) at any location would be 6 seconds, repeated for every train pass (20 times per day). Northbound trains will blow horns ¼ mile south of the Samuel Barnett Boulevard grade crossing, resulting in higher noise levels (105 dB) in this ¼ mile section for the 6-second period. Noise impacts to wildlife will therefore be extremely short in duration. There will not be prolonged exposure to noise that would disrupt breeding or feeding activity.

No measures are necessary or proposed to reduce train noise during wildlife breeding seasons. Such measures are not reasonable, as there are no adverse noise impacts anticipated, and it is not reasonable

[70] http://www.fra.dot.gov/rpd/freight/250.shtml, accessed March 15, 2012

[71] Bhattachyara, M., R.B. Primack and J. Gervein. 2003. Are roads and railroads barriers to bumblebee movement in a temperate suburban conservation area? Biological Conservation 109:37-45.

to reduce train service to New Bedford. Trains are required to sound horns as they approach roadway at-grade crossings, in compliance with FRA safety regulations.

All efforts will be taken to avoid construction during the avian breeding season (May through June) adjacent to the Acushnet Cedar Swamp State Reservation. In all cases construction will be limited to normal daylight hours, which will avoid interference with amphibian breeding calls.

Findings of the CAPS Model—The CAPS model used for the South Coast Rail project evaluated the ecological integrity of the landscape corridors adjacent to each of the alternatives considered in the DEIS/DEIR in the absence of the South Coast Rail, and evaluated the change in ecological integrity with each alternative, measured in IEI units. The model included both the physical barrier effects of the South Coast Rail alternatives (measured as the presence or absence of rail tracks and ballast, the number of tracks, the presence and height of a trestle, and the presence and height of retaining walls) and the noise or disturbance effects of the South Coast Rail alternatives (measured as the number of trains per day and the number of cars per train).

The CAPS analysis is a landscape-level tool useful in understanding secondary impacts to biodiversity and long-term biodiversity shifts that may result from a particular action, rather than the localized smaller impacts resulting from wetland fills.

The analysis showed that the No-Action Alternative had some level of reduced connectedness resulting from the presence of a railbed and culverts along the entire length of the Stoughton route. This railbed with culverts, even in the absence of tracks or rail traffic, represents a partial barrier to the movement of aquatic organisms. The changes in the IEI values as a result of the South Coast Rail project are due to decreased connectedness that result from constructing tracks on ballast, constructing a trestle, or constructing retaining walls (all of which serve, to varying degrees of severity, as barriers to animal movement) or decreased connectedness that results from adding or increasing train traffic. Noise and physical disturbances, to varying degrees of severity depending on the frequency of train movements and the length of the trains, cause wildlife to avoid areas near tracks or avoid crossing tracks.

The CAPS analysis showed that the Stoughton Alternative would result in the loss of IEI units, as shown in Table 4.14-19. Not unexpectedly, the majority of the loss of connectivity (64 percent) would occur north of Weir Junction, where there is no existing rail traffic. The Hockomock trestle would have less impact on connectedness than an at-grade track as it would present less of a barrier to wildlife movement.

Table 4.14-19 Loss of Ecological Integrity–Stoughton Alternative[1]

Option	Total Loss	Loss North of Weir Junction
With Trestle	474.5	302.0
Without Trestle	481.8	309.3

1 Measured in Index of Ecological Integrity Units

Stoughton Diesel Alternative

The Stoughton Diesel Alternative generally would have the same direct and indirect effects to biodiversity as the Stoughton Electric Alternative. However, since there would be no overhead catenary structures or wires, the Stoughton Diesel Alternative would have a reduced impact to the movement of birds across the track. Because this alternative would not require power substations, the Stoughton

Diesel Alternative would have a reduced direct impact to natural communities (1.95 acres) when compared to the Stoughton Electric Alternative.

Whittenton Electric Alternative

The Whittenton Electric Alternative includes reconstructing the Stoughton Line from Canton to Route 138 in Raynham, reconstructing the abandoned Whittenton Branch from Raynham Junction to Whittenton Junction in Taunton, and improving the existing active Attleboro Secondary from Whittenton Junction to Weir Junction. Various traction power substations and an overhead catenary system would be constructed in the same locations as for the Stoughton Alternative. A section of the out-of-service line crosses land within the Hockomock Swamp ACEC.

Biomap Core Habitats

The Whittenton Alternative would cross Biomap Core Habitat in two areas. The Hockomock Swamp, from Foundry Street in Easton south to Bridge Street in Raynham, is designated as Core Habitat. The Whittenton Electric Alternative would create a barrier to wildlife movement through portions of the Hockomock Swamp area (north of the proposed trestle and south of Raynham Park station). This barrier effect is likely to fragment populations of small vertebrates that are unable to cross the railroad tracks. The portion of the Whittenton Electric Alternative that is a proposed trestle (approximately 8,500 feet long) would not impede wildlife movement.

The Whittenton Electric Alternative would create a new canopy gap through portions of the Hockomock Swamp, primarily from Foundry Street south to the proposed Raynham Park station, where the forest canopy has closed over the railbed since the tracks were removed. This canopy gap could impede the movement of forest interior birds across the right-of-way, reducing the effective size of the forest block, and would create new “edge effects” of increased light and temperature, and decreased humidity, adjacent to the right-of-way. The barrier effects would extend upward from the tracks as a result of the overhead catenary system.

Living Waters

The Whittenton Alternative is adjacent to Living Water Core Habitat (LW080) near a reach of the Taunton River that provides habitat for Atlantic sturgeon. As noted in Section 4.15.3.3, the NMFS stated it is unlikely that any species listed under their jurisdiction will be exposed to any direct or indirect effects of the proposed South Coast Rail project. The right-of-way crosses this section of the Taunton River for approximately 125 feet, south of Weir Junction in Taunton (Figure 4.14-3a). The proposed reconstruction would not have a direct or indirect effect on the ability of the Taunton River to support aquatic biodiversity.

Portions of the Acushnet Cedar Swamp, particularly Turner Pond, are designated as Living Waters. The proposed reconstruction of the New Bedford Main Line would be approximately 7,500 feet west of Turner Pond and would not have a direct or indirect effect on the ability of the pond to support aquatic biodiversity.

Fisheries Habitat

The Stoughton Alternative crosses Whitman Brook, Queset Brook, Black Brook, Pine Swamp Brook, Taunton River, Mill River, Cotley River, Cedar Swamp River, and Fall Brook which are all important fisheries habitats. The proposed alternative would reconstruct existing bridges at Whitman Brook, Queset

Brook, Black Brook, Pine Swamp Brook, Cedar Swamp River and the Taunton River, and would construct a new bridge at Black Brook (the former rail bridge was washed out). These bridges would be reconstructed with the same or wider opening, maintaining habitat connectivity and the riverine substrate. The capacity of these waters to support aquatic diversity would not be adversely affected.

According to the Massachusetts Department of Fish and Wildlife comment letter on the DEIS/DEIR, fisheries surveys of the Mill River yielded 10 species, including American eel, black crappie, bluegill, brown bullhead, chain pickerel, common shiner, largemouth bass, pumpkinseed, redfin pickerel and tessellated darter. The NHESP restricts construction activities related to the Mill River to low flow periods of the year in order to prevent impacts to fisheries.

Breeding Bird Diversity

Potential breeding birds along the Whittenton Alternative are similar to Stoughton Alternative (including the Southern Triangle) as detailed above.

Vernal Pools

This section presents a vernal pool assessment, including indirect impacts, to wetland and upland habitat for vernal pool up to 750 feet on either side of the right-of-way of the Whittenton Branch. Similar to the Stoughton Alternative the analysis identified impacts to vernal pools as well as different areas surrounding vernal pools:

Whittenton Branch and Attleboro Secondary—The most ecologically important impacts are to vernal pools that would be directly filled, resulting in a permanent alteration of the pool. The total fill to vernal pools would be 0.36 acre, or 15,465 square feet, and would affect 10 vernal pools.

Table 4.14-20 describes the impacts to vernal pools along the Whittenton Alternative project corridor.

Table 4.14-20 Impacts to Vernal Pools–Whittenton Alternative

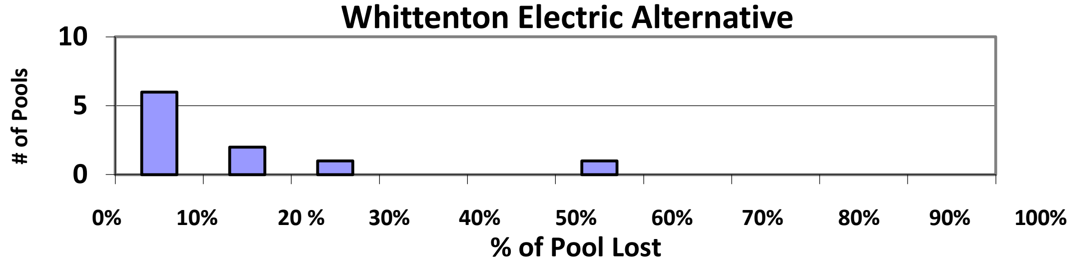
Municipality	Pools Affected	Amount of Fill (SF)	Approx. Size of Pool (SF)	Approx. Size of Pool (Ac.)	Percent of Pool Filled
Stoughton	PVP 23791	1,480	8,579	0.20	17.2%
Stoughton Total	1	1,480	8,579	0.20	
Easton	PVP 7222	2,197	10,324	0.24	21.3%
	VP-10	112	2,373	0.05	4.7%
	EA-2	661	28,403	0.65	2.3%
	CVP 1462	105	5,589	0.13	1.9%
	NCVP-2	553	50,486	1.16	1.1%
	CVP 1463	292	19,148	0.44	1.5%
Easton Total	6	3,920	116,323	2.67	
Freetown	PVP 8324	4,470	53,142	1.22	8.4%
	PVP 8284	873	4,940	0.11	17.7%
	PVP 8286	4,722	7,900	0.18	59.8%
Freetown Total	3	10,065	65,982	1.51	
Totals	10	15,465 (0.36 Ac.)			

Average depths were not calculated for each of the above pools, so the total volume of fill to vernal pools is not known. The amount of filled surface area in square feet gives an approximate measure of the relative size of disturbance to any given pool. One pool, PVP 8286 in Freetown, would have a majority (59.8 percent) of its area filled (Table 4.14-20).

The impacts to the other pools that would be directly affected range from 1.1 percent to 21.3 percent. Easton has the largest number of pools that would be directly affected (6 pools), while Freetown has the largest amount of fill proposed (10,065 SF). While it is impossible to avoid impacting vernal pools to some degree along the Whittenton Alternative, no direct filling would occur to any vernal pools in Canton, Raynham, Taunton, Berkley, Lakeville, New Bedford, or Fall River.

Figure 4.14-22 shows the distribution of the percentage impacts to vernal pools. Of the 10 vernal pools that are impacted, 6 pools would lose to 10 percent or less of their total area, and 8 pools would lose 20 percent or less of their total area.

Figure 4.14-22 Percent Impacts to Vernal Pools
Whittenton Electric Alternative



These results are based on preliminary design. In the final design phase of the project, additional small impacts may be avoided or minimized through different grading (for example, steepened slopes along the rail line). Additional design efforts would attempt to minimize impacts.

Impacts to vernal pool habitat are defined as impacts to any wetland containing a vernal pool within 100 feet of the boundary of a vernal pool. The loss of vernal pool habitat would affect 27 vernal pools. Table 4.14-21 describes the impacts to vernal pool habitat along the South Coast Rail Whittenton Alternative project corridor. Where pools are in close proximity to one another, the impacted areas of vernal pool habitat overlap. In these cases, the impacts to the affected area of vernal pool habitat are identified as a whole, and the pools that make up each affected area are denoted. As a conservative measure, the entire area of the Hockomock Swamp under the proposed trestle in Easton was included in the calculation of total vernal pool habitat, since this entire area is known to provide good habitat for vernal pool amphibians. No impacts to vernal pool habitat would occur in the area under the trestle.

A total of 20 areas would be impacted, affecting a total of 27 vernal pools. The impacts to pools and habitats that would be directly affected range from 0.3 percent to 24.9 percent. Easton has the largest number of pools that would be affected (13 pools), while Taunton has the largest amount of fill proposed (8,759 SF). While it is impossible to avoid impacting vernal pool habitat to some degree along the Stoughton Alternative, no impacts to vernal pool habitat would occur in Canton, Raynham, Lakeville, or Fall River. Additionally, Stoughton and New Bedford would experience impact to vernal pool habitat

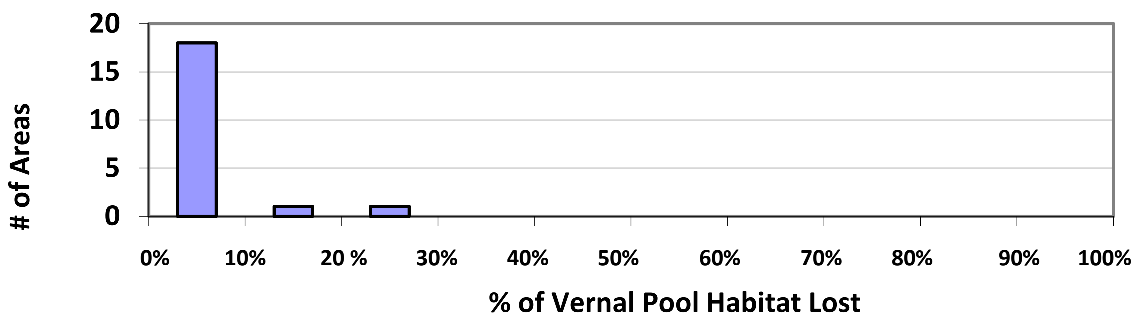
associated with either one or two pools, totaling less than 500 SF in Stoughton and less than 1,300 SF in New Bedford.

Table 4.14-21 Impacts to Vernal Pool Habitat–Whittenton Alternative

Municipality	Pools Affected	Area of Impact to VP Habitat (SF)	Total Area of VP Habitat (SF)	Total Area of VP Habitat (Ac.)	Percent of VP Habitat Impacted
Stoughton	PVP 23791	166	20,488	0.47	0.8%
	CVP 2140	244	21,802	0.50	1.1%
Stoughton Total	**2**	**410**			
	PVP 7222				
	CVP 2152	949	59,472	1.37	1.6%
	PVP 7218	189	52,039	1.19	0.4%
	CVP 2377				
	VP-11	325	56,239	1.29	0.6%
	EA-1				
	EA-2	1,791	89,117	2.05	2.0%
	CVP 1463	3,151	86,590	1.99	3.6%
	PVP 7255				
	PVP 7256	373	116,929	2.68	0.3%
	CVP 1665				
	NHESP 2				
Easton	CVP 1710	819	42,611	0.98	1.9%
Easton Total	**13**	**7,597**			
	PVP 25303	1,860	81,817	1.88	2.3%
	PVP 25306				
	PVP 25302	2,197	224,848	5.16	1.0%
	PVP 25314	369	4,967	0.11	7.4%
	PVP 25317	4,333	17,388	0.40	24.9%
Taunton Total	**5**	**8,759**			
	PVP 2320	6,495	129,756	2.98	5.0%
Berkley	PVP 2353	2,228	15,849	0.36	14.1%
Berkley Total	**2**	**8,723**			
	PVP 8348	185	67,952	1.56	0.3%
	PVP 8324	4,517	80,935	1.86	5.6%
	PVP 8326	822	12,515	0.29	6.6%
Freetown	PVP 8286	1,302	13,391	0.31	9.7%
Freetown Total	**4**	**6,826**			
New Bedford	CVP 2647	1,289	36,463	0.84	3.5%
New Bedford Total	**1**	**1,289**			
Totals	**27**	**33,604 (0.77 ac)**			

Figure 4.14-23 shows the distribution of the percentage impacts to vernal pool habitat. Of the 20 areas impacted, 17 would lose 10 percent or less of their total vernal pool habitat, and 18 would lose 20 percent or less of their total vernal pool habitat.

Figure 4.14-23 Percent Impacts to Vernal Pool Habitat Whittenton Electric Alternative



Impacts to upland buffer habitat are defined as impacts to any naturally-vegetated upland area within 100 feet of the boundary of a vernal pool. The loss of upland buffer habitat would affect 50 vernal pools. Table 4.14-22 describes the impacts to upland buffer habitat along the South Coast Rail project corridor. Where pools are in close proximity to one another, the impacted areas of upland buffer habitat overlap. In these cases, the analysis identifies the impacts to the affected area of upland buffer habitat as a whole, and denotes which pools make up each affected area. Impacts are calculated for the loss of undeveloped land with natural vegetation that could provide non-breeding and/or migratory habitat for vernal pool amphibians. Therefore impacts calculated to upland buffer habitat did not include any areas of existing rail bed or the surrounding ballast, which were estimated by using a measurement of 10 feet to either side of the track centerline. Impacts to and total areas of upland buffer habitat also did not include any existing developed areas, including buildings and parking areas. Developed areas were estimated by using a land use data layer in the GIS analysis and subtracting any areas of development from impacted areas. No impacts to upland buffer habitat would occur in the area under the proposed trestle in Easton.

A total of 35 areas would be impacted, affecting a total of 50 vernal pools. Impacts to upland buffer habitat would be generally larger than impacts to vernal pool habitat, both in terms of area in square feet and in terms of percentage of available upland buffer habitat associated with each vernal pool or cluster of pools. The majority of impact associated with constructing new tracks and widening existing tracks and berms involves existing uplands. The percentage impacts to upland buffer habitat are therefore greatest in areas where this type of habitat is limited to berms and slopes along large wetlands or wetland complexes. For example, the largest percentage impact to upland buffer habitat is at NHESP 3 in Raynham, which would lose 66.9 percent of its upland buffer habitat. The nearby pool of PVP 20158 is approximately the same distance from the limit of disturbance as NHESP 3, but would lose only 33.0 percent of its upland buffer habitat. This lower percentage is due to the fact that PVP 20158 has additional upland area within 100 feet of the boundary of the pool, whereas the upland area within 100 feet of the boundary of NHESP 3 is mainly limited to the railroad berm.

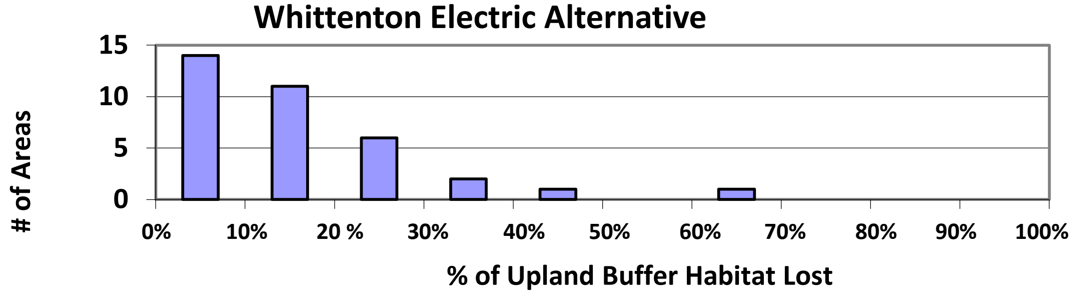
Table 4.14-22 Impacts to Upland Buffer Habitat–Whittenton Alternative

Municipality	Pools Affected	Area of Impact to Buffer Habitat (SF)	Area of Impact to Buffer Habitat (Ac.)	Total Area of Buffer Habitat (SF)	Total Area of Buffer Habitat (Ac.)	Percent of Buffer Habitat Impacted
Stoughton	PVP 23791	3,773	0.09	30,166	0.69	12.5%
	PVP 23784	24,986	0.57	129,503	2.97	19.3%
	CVP 2140	21,393	0.49	103,765	2.38	20.6%
Stoughton Total	**3**	50,152	1.15			
	PVP 7222 CVP 2152 VP-10 VP-3	51,658	1.19	192,509	4.42	26.8%
	PVP 7218	12,024	0.28	120,591	2.77	10.0%
	VP-6	12,348	0.28	35,510	0.82	34.8%
	CVP 2377 VP-11 VP-7	17,797	0.41	123,093	2.83	14.5%
	EA-1 EA-2	12,133	0.28	129,186	2.97	9.4%
	CVP 1462 NCVP-3	16,973	0.39	127,139	2.92	13.3%
	NCVP-2	17,764	0.41	66,665	1.53	26.6%
	CVP 1463	11,386	0.26	28,116	0.65	40.5%
	PVP 7255 PVP 7256	12,068	0.28	107,474	2.47	11.2%
	NHESP 1	12,684	0.29	55,629	1.28	22.8%
	CVP 1712	4,136	0.09	49,627	1.14	8.3%
Easton	CVP 1665 NHESP 2 CVP 1710	11,036	0.25	91,827	2.11	12.0%
Easton Total	**22**	192,006	4.41			
	NHESP 3	4,679	0.11	6,991	0.16	66.9%
	PVP 20158	8,947	0.21	27,104	0.62	33.0%
	PVP 20197 PVP 20195	4,202	0.10	156,331	3.59	2.7%
Raynham	VP-14	4,283	0.10	150,474	3.45	2.8%
Raynham Total	**5**	22,111	0.51			
	PVP 24940A PVP 24940C	4,824	0.11	229,801	5.28	2.1%
	PVP 25217	2,803	0.06	27,411	0.63	10.2%
	PVP 25303	2,853	0.07	40,708	0.93	7.0%
	PVP 25306 PVP 25302	2,462	0.06	16,122	0.37	15.3%
Taunton	PVP 25317 PVP 25316	1,288	0.03	97,900	2.25	1.3%

Municipality	Pools Affected	Area of Impact to Buffer Habitat (SF)	Area of Impact to Buffer Habitat (Ac.)	Total Area of Buffer Habitat (SF)	Total Area of Buffer Habitat (Ac.)	Percent of Buffer Habitat Impacted
Taunton Total	**8**	14,230	0.33			
	PVP 2318					
	PVP 2319	18,684	0.43	75,118	1.72	24.9%
	PVP 2320	8,653	0.20	36,558	0.84	23.7%
Berkley	PVP 2353	2,367	0.05	37,870	0.87	6.3%
Berkley Total	**4**	29,704	0.68			
Lakeville	PVP 11932	5,557	0.13	237,065	5.44	2.3%
Lakeville Total	**1**	5,557	0.13			
	PVP 8348	1,717	0.04	18,615	0.43	9.2%
	PVP 8324	1,191	0.03	37,652	0.86	3.2%
	PVP 8326	969	0.02	21,773	0.50	4.5%
Freetown	PVP 8308	5,793	0.13	47,416	1.09	12.2%
	PVP 8284	6,500	0.15	47,444	1.09	13.7%
	PVP 8286	11,045	0.25	69,954	1.61	15.8%
Freetown Total	**6**	27,215	0.62			
New Bedford	CVP 2647	1,448	0.03	22,081	0.51	6.6%
New Bedford Total	**1**	1,448	0.03			
Totals	**50**	342,423	7.86			

Figure 4.14-24 shows the distribution of the percentage impacts to upland buffer habitat. Of the 35 areas impacted, 14 would lose 10 percent or less of their total upland buffer habitat, and 25 would lose 20 percent or less of their total upland buffer habitat. Ten areas would lose more than 20 percent of their total upland buffer habitat. While impacts to upland buffer habitat can affect the ability of vernal pools to sustain viable populations, all affected pools have additional upland buffer habitat or surrounding upland habitat contiguous to their impacted upland buffer habitat, with the exception of pool NHESP 3.

Figure 4.14-24 Percent Impacts to Upland Buffer Habitat Whittenton Electric Alternative



Impacts to surrounding upland habitat are defined as impacts to any naturally vegetated upland area between 100 and 750 feet of the boundary of a vernal pool. For these pools, point locations were used to represent each pool. The loss of surrounding upland habitat would affect 116 vernal pools. Table 4.14-23 lists the impacts to surrounding upland habitat along the South Coast Rail project corridor.

Where pools are in close proximity to one another, the impacted areas of buffer habitat overlap. In these cases, the impacts to the affected area of surrounding upland habitat are identified as a whole, and the pools that make up each affected area are denoted. Impacts are calculated for the loss of undeveloped land with natural vegetation that could provide non-breeding and/or migratory habitat for vernal pool amphibians. The impacts calculated for surrounding upland habitat did not include any areas of existing rail bed or the surrounding ballast, which were estimated by using a measurement of 10 feet to either side of the track centerline. Impacts to and total areas of surrounding upland habitat also did not include any existing developed areas, including buildings and parking areas. Developed areas were estimated by using a land use data layer in the GIS analysis and subtracting any areas of development from impacted areas. No impacts to surrounding upland habitat would occur in the area under the proposed trestle in Easton. For a single pool surrounded by completely undeveloped area, the total potential surrounding upland habitat would be over 40 acres.

Table 4.14-23 Impacts to Surrounding Upland Habitat–Whittenton Alternative

	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 23791	0.63	10.42	6.0%
	PVP 23778	1.72	35.57	4.8%
Stoughton	PVP 23784			
	CVP 2140	**8.63**	**54.45**	**15.9%**
Stoughton Total	4	10.98		
	PVP 7222			
	CVP 2152			
	VP-10			
	VP-3			
	PVP 7218			
	VP-6			
	CVP 2377			
	VP-11			
	VP-7			
	PVP 7220			
	PVP 7221			
	PVP 7219			
	CVP 2153			
	CVP 2154			
	PVP 7223			
	VP 2			
	VP 4	4.15	66.10	6.3%
	CVP 1827	0.19	16.37	1.2%
	EA-1			
	EA-2			
	CVP 1462			
	NCVP-3			
Easton	NCVP-2	1.39	48.56	2.9%

	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 7242			
	CVP 1463			
	PVP 7255			
	PVP 7256			
	PVP 7254			
	PVP 7324			
	PVP 7257			
	PVP 7325	1.60	46.42	3.4%
	NHESP 1	0.61	10.69	5.7%
	CVP 1712			
	CVP 1665			
	NHESP 2			
	CVP 1710	1.57	60.97	2.6%
Easton Total	36	9.50		
	PVP 20158			
	NHESP 3	0.75	4.55	16.4%
	PVP 20178			
	PVP 20179			
	PVP 20181			
	PVP 20182	1.99	56.30	3.5%
	PVP 20186			
	PVP 20189	0.40	33.67	1.2%
	PVP 20193	0.70	17.30	4.1%
	PVP 20198			
	PVP 20197			
	PVP 20195			
	PVP 20196			
	VP-14	0.54	46.89	1.2%
	PVP 20227	0.07	29.61	0.2%
Raynham	PVP 25188	0.43	21.15	2.0%
Raynham Total	16	4.88		
	PVP 25210	0.25	8.38	3.0%
	PVP 25209			
	PVP 25208	0.43	32.27	1.3%
	PVP 24940			
	PVP 24940A			
	PVP 24940C			
	PVP 25215			
	PVP 25216			
	PVP 25217	1.03	72.98	1.4%
	PVP 25227	0.01	7.32	0.1%

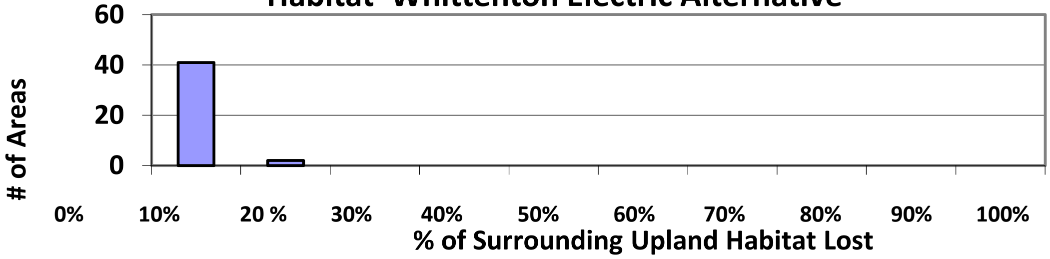
	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 25303			
	PVP 25302			
	PVP 25304			
	PVP 25305			
	PVP 25306			
	PVP 25308			
	PVP 25307			
	PVP 25309			
	PVP 25310	0.38	21.36	1.8%
	PVP 25317			
	PVP 25316			
	PVP 25315			
	PVP 25318	0.58	47.67	1.2%
	PVP 25395			
Taunton	PVP 25397	1.29	32.96	3.9%
Taunton Total	25	3.97		
	PVP 2316	0.83	21.67	3.8%
	PVP 2318			
	PVP 2319			
	PVP 2320			
	PVP 2317	1.60	62.16	2.6%
	PVP 2353	0.39	18.49	2.1%
	PVP 2354			
	PVP 2356			
	PVP 2358	0.46	31.14	1.5%
	PVP 2360	0.96	15.39	6.3%
Berkley	PVP 2361	0.02	13.79	0.1%
Berkley Total	11	4.26		
	PVP 11932	0.38	18.88	2.0%
	PVP 11931	0.20	24.75	0.8%
Lakeville	PVP 11883	0.12	8.93	1.4%
Lakeville Total	3	0.70		
	PVP 8348	0.42	14.07	3.0%
	PVP 8362	0.33	28.17	1.2%
	PVP 8324	0.17	12.42	1.4%
	PVP 8326	0.48	24.56	1.9%
	PVP 8308			
	PVP 8309			
	PVP 8310	1.34	63.30	2.1%
Freetown	PVP 8312			
	PVP 8313	0.46	29.68	1.6%

	Pools Affected	Area of Impact to Surrounding Upland Habitat (Ac.)	Total Area of Surrounding Upland Habitat (Ac.)	Percent of Upland Habitat Impacted
	PVP 8284			
	PVP 8286			
	PVP 8283			
	PVP 8285			
	PVP 8287	3.05	55.18	5.5%
Freetown Total	14	6.26		
New Bedford	CVP 1892			
	CVP 1893	0.23	34.01	0.7%
	CVP 2647			
	PVP 15554	0.28	18.42	1.5%
	CVP 2525	0.29	26.71	1.1%
	PVP 15571			
	PVP 15572	0.26	35.64	0.7%
New Bedford Total	7	1.06		
Totals	116	41.61		

A total of 43 areas would be impacted, affecting a total of 116 vernal pools. While impacts to surrounding upland habitat are larger in terms of size than either vernal pool habitat or upland buffer habitat, the overall impacts would be negligible. The large total area of surrounding upland habitat around a given pool, or more often a cluster of pools, tends to ameliorate the impacts to surrounding upland habitat in any one area. The largest percentage impact to surrounding upland habitat is around the pair of pools PVP 20158 and NHESP 3 in Raynham (Figure 4.14-25), which would lose 16.4 percent of their surrounding upland habitat. This impact is due to a combination of significant wetland areas surrounding these two pools as well as large developed areas on the eastern side of the right-of-way. The pair of pools PVP 23784 and CVP 2140 in Stoughton would lose 15.9 percent of their surrounding upland habitat from constructing the North Easton station. Impacts to pools already segregated from the right-of-way by an existing road, such as PVP 4291 in Canton, are unlikely to have any real effect on the pool in question. Conversely, in areas such as that around the pair of pools PVP 23778 and PVP 23779 in Stoughton, impacts are more likely to exclusively affect PVP 23778 due to the separation of PVP 23779 from the right-of-way, again by an existing roadway. Still, the overall effects to either pool would be very small since both have a large contiguous area of surrounding upland habitat around the pool. There are no pools or cluster of pools along the length of the Stoughton Alternative corridor that would have a large percentage of surrounding upland habitat impacted.

Figure 4.14-25 shows the distribution of the percentage impacts to surrounding upland habitat. Of the 43 areas impacted, 41 would lose 10 percent or less of their total surrounding upland habitat, and all 43 would lose less than 20 percent of their total surrounding upland habitat.

Figure 4.14-25 Percent Impacts to Surrounding Upland Habitat Whittenton Electric Alternative



Fragmentation Effects—New fragmentation effects would occur entirely in Easton, Raynham, and Taunton. One additional cluster in Freetown already has PVP 8283 separated from PVPs 8284, 8285, 8286, and 8287 by an existing maintained railway, so additional fragmentation effects are unlikely. Fragmentation is likely to have the largest effects in cases where one pool is newly separated from a cluster, or where a pair of pools is separated to create two single pools, and when the pools are close together (i.e., within 100 feet of one another). This would occur, for example, in Easton, where VP-3 is separated from a cluster of four other pools. In the areas of fragmentation listed in Table 4.14-24, there are no cases where one pool is separated from a pair or cluster without at least some extant surrounding habitat of its own.

Table 4.14-24 Fragmentation Effects–Whittenton Alternative

Municipality	Pools on Western Side of ROW	Pools on Eastern Side of ROW	Fragmentation occurs within 100 feet	Fragmentation occurs within 750 feet
Easton	VP-3	PVP 7222 CVP 2152 PVP 7223 VP-10	X	
	PVP 7219 PVP 7218 CVP 2153	CVP 2154 VP-7 CVP 2377		X
	VP-11	VP-7 CVP 2377	X	
	EA-1	EA-2	X	
	CVP 1462	NCVP-3	X	
	PVP 7255	PVP 7256	X	
	PVP 7255	PVP 7234 PVP 7257		X
Raynham	PVP 20181	PVP 20178		X

Municipality	Pools on Western Side of ROW	Pools on Eastern Side of ROW	Fragmentation occurs within 100 feet	Fragmentation occurs within 750 feet
	PVP 20179			
	PVP 20182			
	PVP 20198	VP-14		X
	PVP 20197			
	PVP 20195			
	PVP 20196			
	CVP 1971	CVP 1972	X	
Taunton	PVP 25318	PVP 25315		X
	PVP 25317			
	PVP 25316			

Table 4.14-25 presents the direct and indirect impacts to vernal pools within 750 feet of the right-of-way of the Whittenton Branch. Figures 4.14-10a and 4.14-10b show the vernal pools in proximity to the Whittenton Branch and Attleboro Secondary.

Table 4.14-25 Vernal Pool Impacts along the Whittenton Branch

Pools Directly Filled	Amount of Fill (ac)	Pools with VP Wetland Habitat Impacted	Amount of Impact (ac)	Pools with Upland Buffer Habitat Impacted	Amount of Impact (ac)	Pools with Surrounding Upland Habitat Impacted	Amount of Impact (ac)
0	0.0	0	0.0	5	0.7	17	2.8

Summary of Entire Whittenton Alternative

A total of 116 vernal pools lie along or within 750 feet of the right-of-way of the Whittenton Alternative as a whole. A total of 10 vernal pools would receive direct fill as a result of constructing the Whittenton Alternative, for a total of 0.4 acre of fill. A total of 27 vernal pools would receive fill to vernal pool wetland habitat, for a total of 0.8 acre of fill. The upland buffer habitat of 50 vernal pools would be impacted, for a total of 7.86 acres of impact. The surrounding upland habitat of 116 vernal pools would be impacted, for a total of 41.61 acres of impact. Table 4.14-26 summarizes the direct and indirect impacts to vernal pools along the Whittenton Alternative as a whole.

Table 4.14-26 Vernal Pool Impacts along the Whittenton Alternative

Pools Directly Filled	Amount of Fill (ac)	Pools with VP Wetland Habitat Impacted	Amount of Impact (ac)	Pools with Upland Buffer Habitat Impacted	Amount of Impact (ac)	Pools with Surrounding Upland Habitat Impacted	Amount of Impact (ac)
10	0.36	27	0.8	50	7.86	116	41.61

The following points summarize the impacts by municipality.

- Canton: There are no impacts in Canton. The one vernal pool within 750 feet of the right-of-way is already separated from the right-of-way by an existing roadway.

- Stoughton: Impacts in Stoughton are small. One pool (PVP 23791) would receive direct fill but has large contiguous areas of adjacent vernal pool habitat, upland buffer habitat, and surrounding upland habitat around it. No clusters of pools are present.

- Easton: Six pools would receive direct fill in Easton, although only one (PVP 7222) would lose greater than 20 percent of its area. While upland buffer habitat within 100 feet would be impacted around several pools, in all cases these pools have additional surrounding upland habitat between 100 and 750 feet away. Several clusters and pairs of pools are in close proximity to the right-of-way and would experience fragmentation both of associated habitats and of entire pools from one another. The majority of these clusters and pairs are in close association with one another (i.e., pools are within 100 feet of each other or within 100 feet of another pool in the same cluster).

- Raynham: No fill would occur to any vernal pools or to any vernal pool habitat. One pool (NHESP 3) would lose upland buffer habitat and does not have contiguous adjacent upland habitat nearby. Two clusters of pools would experience fragmentation within 750 feet, plus an additional pair of pools which would experience fragmentation within 100 feet.

- Taunton: No fill would occur to any vernal pools. Five pools would receive impact to vernal pool habitat, with one pool in particular (PVP 25317) losing 24.9 percent of its vernal pool habitat. Taunton also has some of the largest impacts to upland buffer habitat. However, in all cases these pools have additional habitat between 100 and 750 feet away. Taunton also has one cluster of pools that would experience fragmentation within 750 feet.

- Berkley: Impacts in Berkley would be small. No pools would receive direct fill, and impacts to vernal pool habitat are small. Impacts to upland buffer habitat, particularly around PVP 2318 and PVP 2319 are more significant, but these pools have additional surrounding upland habitat. No cases of fragmentation between pools occur in Berkley.

- Lakeville: Impacts in Lakeville are very small. Few vernal pools exist along the right-of-way and no pools would receive direct fill. Impacts to other associated habitats are also small, and there are no cases of fragmentation between pools.

- Freetown: One pool (PVP 8286) in Freetown would receive fill to a majority of its area, and would also receive an impact greater than 25 percent to both vernal pool habitat and upland buffer habitat. The nearby pool of PVP 8284 would also receive direct fill as well as impacts to vernal pool habitat and upland buffer habitat. In both cases these pools have additional habitat between 100 and 750 feet away. The remainder of the pools in Freetown do not receive large impacts.

- New Bedford: Impacts in New Bedford would be very small. Few pools exist along the right-of-way. No pools would receive direct impacts, and impacts to other associated habitats are small, with exception of one large impact to the upland buffer habitat of CVP 2647. However this pool has large unfragmented areas of additional surrounding upland habitat.

- Fall River: There are no impacts in Fall River.
- Overall, impacts to vernal pools along the South Coast Rail Whittenton Alternative project corridor are small and are not likely to compromise the functions of pools or communities of pools along the route. One vernal pool would lose a majority of its area (PVP 8286 in Freetown). Of the remaining pools, no pool or group of pools would lose a majority of its vernal pool habitat, upland buffer habitat or supporting upland habitat. Additionally, pools that lose areas of associated habitats have additional, larger contiguous areas of these habitats adjacent to them, with the exception of NHESP 3 in Raynham.

Fish and Wildlife Crossings—A detailed inventory of bridges and culverts was conducted to identify the location, condition, and function of each structure. Dimensions, construction materials, and railroad bed characteristics were recorded. For this biodiversity assessment, the subset of bridges and culverts with potential ecological value was determined by reviewing wetland mapping, surrounding land use (as visible in aerial photographs), and other ecological setting features (as modeled by CAPS[72]) of the complete bridge and culvert inventory. The CAPS model output indicates areas with a high (over 50 percent) Index of Ecological Integrity (IEI). No areas with a high IEI exist along the Whittenton Branch.

Most of the culverts along the Whittenton Branch currently have limited ecological function. Almost all of culverts under the Whittenton Branch right-of-way are at least 50 feet in length; the use of these culverts by wildlife for crossing the right-of-way is unlikely. The culvert connecting Wetlands RWB 02 and RWB 02.1 in Raynham is the largest culvert along the Whittenton Branch, measuring four feet wide and nearly 5 feet high, and approximately 35 feet in length. This culvert is large enough and allows enough daylight to penetrate to allow for animal passage under the right-of-way. This culvert appears to carry little water from drainage ditches along Wetland RWB-02.1 and is dry for long portions of the year. However, most of the land on the eastern side of this culvert is residential, impacting the usefulness of this culvert. At least one culvert along the right-of-way (between Wetlands TWB 09 and TWB 10) is mostly collapsed or buried, and has a reduced hydrologic function and little or no ecological function.

The bridge and most of the culverts along the Whittenton Branch alignment will be replaced to meet engineering requirements for operation of the South Coast Rail. The track design is conceptual at this stage but takes into consideration operational and safety requirements as well as the gentle elevation change requirements of a fixed guideway transit system. Railroad track elevation changes and curves must be gradual to accommodate the design requirements for a safe high speed train track. Additionally, the railroad bed must meet certain width and depth specifications (depending on the nature of the underlying ground surface) to provide proper track support and ballast drainage.

Piers or pilings supporting the existing Mill River bridge will be replaced by a single pier at the center of a two-span structure, minimizing impacts to stream hydrology and fish habitat. Existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center of the span. New cast-in-place concrete abutments would be constructed behind the existing abutments, which would then be partially removed to an elevation equal to the river's average seasonal high water elevation to improve wildlife passage.

Other Important Habitat Areas—The Whittenton Alternative crosses two large undeveloped areas that provide potentially important wildlife habitat. Near the north end of the Whittenton Branch is a large

[72] UMass Extension. 2011. CAPS Index of Ecological Integrity. http://umasscaps.org/.

undeveloped forested upland and wetland complex that includes Prospect Hill Pond. Near its south end, the Whittenton Branch crosses a large undeveloped wetland and upland complex just north of Whittenton Junction. The former right-of-way through these areas is currently used as a recreational trail for ATVs, and as an access road for a gravel pit in the southern portion. Restoring the track would create a barrier to the movement of small vertebrates, fragmenting habitat and potentially affecting genetic diversity and long-term persistence of some populations. The overhead catenary system of poles and wires would increase the width of the canopy gap, potentially affecting bird movement

Indirect Impacts of the Whittenton Electric Alternative: Stoughton/Whittenton Rail Segment

The analysis of indirect impacts evaluates the effects of the Whittenton Electric Alternative on key elements of biodiversity. Where the Whittenton Alternative's impacts on natural communities would occur entirely along the edge of, existing active rail lines, indirect impacts to natural communities, wildlife or fisheries are anticipated to be minor and restricted to the edges of these communities. The Whittenton Alternative also has the potential to cause larger indirect effects to natural communities where it would reconstruct an out-of-service rail line, particularly along the Stoughton Line south of Foundry Street in Easton, and along the Whittenton Branch from Raynham Junction to Whittenton Junction in Taunton.

Converting the out-of-service railroad alignment to active rail would increase habitat fragmentation in two areas: the Prospect Pond area and the southernmost section of the Whittenton Branch between the quarry access road and Whittenton Junction. None of these areas are mapped as Important Wildlife Habitat by DEP. Although the proposed project would not substantially increase or create a new canopy gap, and therefore would not change the existing forest interior conditions, there would be increased train activity and noise, and the raised track would impede movement of small vertebrates. Reconstructing the railroad track system at the southernmost end of the Whittenton Branch, between the quarry access road and Whittenton Junction, would increase the width of the canopy gap over the railbed to 30 feet wide in areas with single track. Although this would increase the canopy gap and create a partial barrier to vertebrate movement the adjacent areas would continue to provide moderate sized forest blocks and would sustain wildlife habitat.

Vegetation—The information and analyses presented for the Stoughton Alternative are equally applicable to this section of the Whittenton Alternative.

Habitat Fragmentation and Noise Impacts—The information and analyses presented for the Stoughton Alternative are equally applicable to this section of the Whittenton Alternative

Findings of CAPS Model—The CAPS analysis showed that the Whittenton Alternative would result in the loss of IEI units, as shown in Table 4.14-27. Not unexpectedly, the majority of the loss of connectivity (64 percent) would occur north of Weir Junction, where there is no existing rail traffic. The Hockomock trestle would have less impact on connectedness than an at-grade track as it would present less of a barrier to wildlife movement.

Table 4.14-27 Loss of Ecological Integrity–Whittenton Alternative[1]

Option	Total Loss	Loss North of Weir Junction
With Trestle	484.6	312.1
Without Trestle	492.0	319.5

1 Measured in Index of Ecological Integrity Units

Whittenton Diesel Alternative

The Whittenton Diesel Alternative would generally have the same effects on biodiversity as the Whittenton Electric Alternative. However, there would be no overhead catenary system and consequently a slightly lower impact on continuity of forest bird habitats. Because there would be no power substations, the Whittenton Diesel Alternative would result in 2.24 acres less habitat loss overall compared to the Whittenton Electric Alternative.

Stations

Station locations have remained as shown in the DEIS/DEIR, with the exception of the Stoughton Station, which was relocated to eliminate conflicts with traffic in Stoughton Center and to support downtown revitalization efforts. Additionally, the Downtown Taunton Station has been replaced by the Dana Street Station, which would be located on the east side of the railroad between the alignment and Dana Street.

Station layout, parking, grading, and drainage designs have been advanced since completion of the DEIS/DEIR at the North Easton, Easton Village, Raynham Park, Taunton, Taunton Depot, and Freetown locations. The majority of the proposed stations would be in developed areas and would not affect natural habitats or biodiversity. These stations (Battleship Cove, Easton Village, Fall River Depot, King's Highway, Taunton, Dana Street, and Whale's Tooth) are not included in this analysis. Reconstructing existing commuter rail stations (Canton, Canton Junction, Mansfield, and Stoughton) would also not affect biodiversity. The remaining stations (Taunton Depot, Freetown, North Easton, and Raynham Park) are discussed in this section.

Taunton Depot—Taunton Depot Station (Figure 4.14-26) would be a new station constructed on the Attleboro Secondary in Taunton and would serve all of the rail alternatives. The proposed station site is in a previously-disturbed area and is not within a large block of undisturbed habitat. Impacts to biodiversity would be negligible. Approximately 6.01 acres of habitat would be lost, largely cleared land (disturbed habitat).

Freetown—Freetown Station (Figure 4.14-27) would be a new train or bus station constructed to serve the Fall River Secondary for all rail alternatives. The proposed station site may fragment an already disturbed corridor of forest and fields that extends from the Copicut Road/Route 24 intersection to South Main Street, along the west side of the active freight tracks. While there is development along the frontage of South Main Street, this development has also resulted in the clearing and grading of adjacent land surrounding the development. Constructing the proposed station may fragment this area and reduce habitat value of the remaining portions. Approximately 4.33 acres of habitat would be lost, largely upland shrub habitat.

North Easton—North Easton Station (Figure 4.14-28) would be a new station constructed on the Easton/Stoughton town line. The station is proposed on the east side of the Stoughton Line right-of-way in an area partially consisting of a heavily disturbed, mostly unvegetated area, and partially within a mixed forested area. The station would be directly east of the Stoughton Memorial Conservation Lands, a large and important habitat area. Approximately 8.40 acres of habitat would be lost, largely upland forest and shrub land. Impacts to biodiversity are expected to be minimal and will result in increased edge effects surrounding the station. Minor edge effects on the adjacent conservation land could occur as a result of noise, lights and activity at the station. No mapped rare species habitats occur in proximity to the station.

Raynham Park—Raynham Park Station (Figure 4.14-29) would be a new station constructed along the Stoughton Line that would serve the Stoughton and Whittenton Alternatives. It would be constructed in a disturbed area adjacent to the north buildings of the Raynham Park. The area is mostly paved and has been previously altered. Stormwater controls will be implemented into the project design to improve the water quality of runoff leaving the site and entering the receiving waters, which flow into the Hockomock Swamp ACEC.

Effects to biodiversity are expected to be minimal from construction of this station because the station will be constructed in disturbed upland that is mostly paved. Approximately 3.25 acres of habitat would be lost, largely wooded uplands.

Layover Facilities

One of the proposed layover sites (Weaver's Cove East) would affect undeveloped land with the potential to support biodiversity and is described below. The Wamsutta site (Figure 4.14-3e) proposed along the New Bedford Main line and the mid-day layover facility planned for the Boston area would be entirely within previously developed land and do not support biodiversity.

Fall River–Weaver's Cove East—The proposed Weaver's Cove East layover facility (Figure 4.14-4b), would be located east of the Fall River Secondary in a previously-disturbed and developed area, and approximately 100 feet from the Taunton River. It is partially a brownfield site that is cleared (some foundations and roadways remain) but is mostly undeveloped. Constructing a layover facility at this location would result in the loss of 9.12 acres of plant communities, primarily upland forest and cleared land.

4.14.3.3 Temporary Construction-Period Impacts

Constructing the South Coast Rail alternatives could result in temporary, short-term impacts to biodiversity during the construction period.

Temporary Impacts

Temporary impacts include short-term disturbances to biological resources during construction that would cease once construction activities are complete. This may include, but is not limited to, installing erosion controls, establishing work areas, or installing temporary structures at stream crossings.

Potential short-term construction related impacts may include impaired ground and surface water due to sedimentation in stormwater runoff or accidental spills; displaced wildlife due to physical disturbance and noise; and plant and animal injury or death from construction equipment and activities.

Sediment discharges to surface water bodies could increase turbidity, potentially clogging the gills or feeding apparatus of aquatic organisms. Sediment accumulation on aquatic substrates could affect fish breeding habitat, or could reduce the growth of aquatic plants. Sediment discharges to vernal pools could affect the survival of aquatic larvae.

Temporary impacts to water quality during construction would be reduced or eliminated through the use of appropriate best management practices, documented in the Stormwater Pollution Prevention Plan (SWPPP) prepared and implemented in accordance with the requirements of the NPDES Construction Permit program. BMPs for erosion control would include perimeter sedimentation controls (silt fence, haybales, filter berms, siltation booms), temporary stabilization of disturbed areas, and

temporary siltation basins where appropriate. The proposed project is not anticipated to result in long-term adverse effects to water quality, as the proposed design will treat runoff generated by the track prior to discharge, and will comply with all of the Massachusetts Stormwater Standards for work at the proposed stations. Compliance with the standards ensures that the proposed stations will not affect groundwater discharge that supports base streamflows, as well as protecting water quality. Following construction all construction areas will be permanently stabilized with pavement, railroad ballast, or vegetation, and will not change siltation in any waterway. None of the proposed stations would discharge runoff to a waterway.

The proposed project will not result in the loss of riparian habitat. The rehabilitation of existing commuter rail and freight rail lines will not affect riparian habitat. The restoration of out-of-service rail right-of-way through Stoughton, Easton, Raynham and Taunton will likely require that vegetation within the right-of-way, adjacent to waterways, be removed to the proposed width of the ballast (ranging from 25 to 40 feet, depending on the topography and the number of tracks). This will remove overhanging vegetation from short segments (25 to 40 feet) of Whitman Brook, Black Brook, and Pine Swamp Brook, but is not anticipated to change water temperatures as the overhanging vegetation will be replaced by a bridge, maintaining shade over the banks and channel.

The only stocked trout water is Rattlesnake Brook. No work is proposed within or adjacent to the waterway at this location, as Rattlesnake Brook is below Route 24.

Erosion and sedimentation controls along the perimeter of the railroad corridor may affect the ability of small vertebrates (amphibians, turtles, small rodents) to cross the railroad right-of-way during construction. This barrier effect would be temporary and would cease when erosion controls were removed. Coffer dams or sandbags used to allow bridges or culverts to be replaced could affect the movement of fish if the entire waterway were blocked.

Construction noise and construction activity could displace wildlife from areas adjacent to the rail or highway corridor. This impact would be temporary, and wildlife is expected to return to areas near the rail or highway corridor once construction activities cease.

Temporary Impacts–Stoughton Alternatives

The Stoughton Alternatives would have temporary impacts to terrestrial and aquatic wildlife communities along the Stoughton Line, New Bedford Main Line (north of Route 140) and the Fall River Secondary (north of the developed center of Fall River). In the absence of mitigation, these impacts could be most severe along undeveloped areas with important aquatic habitats (the Hockomock Swamp, Pine Swamp, the New Bedford Main Line through the Assonet Cedar Swamp, and the New Bedford Main Line at the boundary of the Acushnet Cedar Swamp).

Temporary Impacts–Whittenton Alternatives

The Whittenton Alternatives would have temporary impacts to terrestrial and aquatic wildlife communities along the Stoughton Line, the Whittenton Branch, the Attleboro Secondary (except through the developed center of Taunton), the New Bedford Main Line (north of Route 140) and the Fall River Secondary (north of the developed center of Fall River). In the absence of mitigation, these impacts could be most severe along undeveloped areas with important aquatic habitats (the Hockomock Swamp, Prospect Hill Pond, the New Bedford Main Line through the Assonet Cedar Swamp, and the New Bedford Main Line at the boundary of the Acushnet Cedar Swamp).

Mitigation for Construction-Period Impacts

Construction impacts to aquatic resources will be mitigated by the appropriate use of erosion and sedimentation controls to minimize and eliminate sedimentation of wetlands and waterways. Erosion and sedimentation controls would be installed before construction begins, properly maintained, and removed after disturbed areas have stabilized. A Stormwater Pollution Prevention Plan would be developed and implemented as required by the NPDES Construction General Permit. Erosion controls would be monitored and maintained throughout the construction period, and removed after disturbed areas have stabilized.

Timing of construction may affect the extent of impacts to fish and wildlife species. Disturbance of habitat during the breeding season is likely to have greater short-term or individual effects on reproductive success, though short-term effects are not likely to have long-term repercussions unless the species population is already unstable. To avoid potential short-term effects to breeding wildlife, all efforts will be taken to avoid construction during the breeding season (March through June) in Hockomock and Pine Swamps, and in areas where movement of rare species is a concern. In all cases construction will be limited to normal daylight hours. Additional measures, such as “turtle gates,” may be used in sensitive areas to allow small vertebrates to cross the right-of-way during critical breeding periods.

The vast majority of areas disturbed for construction (extending 14 feet to each side of the track centerline, for a total width of 28 feet for single track and 42 feet for double track) will be surfaced with ballast and will be within the area where vegetation must be managed for railroad safety. These areas will not be allowed to revegetate. Disturbed areas outside of the trackbed would be seeded with an appropriate stabilization seed mix using native species. These seeded areas would be expected to revegetate within one growing season.

4.14.3.4 CAPS Analysis Impacts

The results of the CAPS analysis show that the differences among the alternatives are obscured to some degree by the large sections of the routes that are common to all the alternatives. To better highlight the differences among the alternatives, the analysis computed the IEI for each alternative only for those sections that were not shared among all alternatives (i.e., excluding the Southern Triangle south of Weir Junction and tracks north of Canton Junction) (Table 4.14-28).

Table 4.14-28 Loss of Index of Ecological Integrity Units

Alternative	Direct Loss	Indirect Loss	Total Loss	Total Loss Excluding Common Elements
Stoughton with Trestle	17.6	456.9	474.5	302.0
Stoughton without Trestle	17.7	464.1	481.8	309.3
Whittenton with Trestle	17.6	467.1	484.6	312.1
Whittenton without Trestle	17.7	474.3	492.0	319.5

This analysis shows that reconstructing the tracks and re-introducing commuter rail service on the Southern Triangle (the New Bedford Main Line from Weir Junction to Whale's Tooth, and the Fall River Secondary from Myricks Junction to Battleship Cove, including stations in undeveloped areas at Taunton Depot and Freetown) would result in a decrease of 172.5 IEI Units. This represents 36 percent of the total loss for the Stoughton (with trestle) Alternative or the Whittenton Alternatives. Figure 4.14-30 shows the effect of the Southern Triangle on IEI Units. Within the Southern Triangle there is no change in connectedness among the different rail alternatives.

The Stoughton (Figures 4.14-31 and 4.14-32) and Whittenton (Figures 4.14-33 and 4.14-34) Alternatives are similar, with the Whittenton Alternatives showing a slightly higher loss of IEI Units. The trestle through the Hockomock Swamp would reduce the biodiversity effects for either the Stoughton or Whittenton Alternatives by 7 IEI Units.

The CAPS analysis shows that three metrics, connectedness, similarity, and traffic intensity, have the greatest effect on the loss of IEI Units. Connectedness, with its broader scale and integration of landscape resistance, is the most relevant metric. The change in connectedness is shown by the different color tones (darker areas = higher loss). Implementation of the rail alternatives would result in no change in connectedness within the Southern Triangle among the different rail alternatives. The higher rates of train traffic on the New Bedford Main Line and the Fall River Secondary would result in a slight decrease in connectivity through the Assonet Cedar Swamp area in Lakeville when compared to the existing connectedness (Figure 4.14-35 and Figure 4.14-36).

The Stoughton and Whittenton Alternatives would reduce connectivity in the Hockomock Swamp with a gradient ranging from major impacts close to the rail line to negligible impacts at greater distances, compared to the existing connectedness (Figure 4.14-37). Without a trestle (Figure 4.14-38), these alternatives would result in substantial losses in connectivity in the Hockomock Swamp east of the rail line, between the Raynham dog track and Foundry Street and between the rail line and Route 138, and in some areas west of the rail line. Moderate impacts would extend through much of the Hockomock, including areas east of Route 138. These impacts would be reduced by the trestle (Figure 4.14-39), with major losses restricted to a smaller area east of the rail line and north of the dog track. Impacts would also extend over a smaller area than the "no-trestle" option.

The restoration of commuter rail through Pine Swamp in Raynham, for the Stoughton Alternatives, would result in a decrease in connectivity throughout the swamp when compared to the existing connectedness (Figure 4.14-40). The effect is moderate, with some higher areas of decrease occurring west of the rail line (Figure 4.14-41).

Relevance of the CAPS Model to Mitigation and Limitations of CAPS Analysis

In November 2011 the UMass Extension Center for Agriculture published two sets of town maps based on CAPS. In conjunction with DEP, UMass produced Important Wildlife Habitat maps. In cooperation with the applicant and the Federal Highway Administration (FHWA), UMass produced IEI maps showing the 50 percent of the landscape with the highest IEI values and color-coded by habitat type (forests, shrublands, freshwater wetlands and aquatic habitats). These maps show the existing conditions and are useful in visualizing the existing important biodiversity areas. In addition, these maps are useful in identifying areas where biodiversity mitigation may be of the most value.

Because CAPS is a coarse-filter analysis based on the ecological and geospatial information available in 30 x 30 meter squares, it is not sufficiently fine-grained to evaluate the effects of specific mitigation

measures such as improved culverts. The CAPS input data for stream crossings includes only three character-states: no obstruction, bridge, or culvert. Even if more fine-grained gradations of culverts were added to the data set (i.e., culverts smaller than 24 inches, culverts 24 to 48 inches, culverts wider than 48 inches) the likely change in IEI values would be negligible, given that IEI values are in the scale of acres.

CAPS is also not an appropriate tool for evaluating the effects of mitigation measures such as wetland creation, wetland restoration, or habitat protection/preservation. Because the model assesses landscape-level changes in physical conditions, a change from unprotected land to protected land does not change the IEI status of a particular area.

In addition, CAPS as applied to this project does not account for the effects of the existing railroad grade on overall landscape condition. The railroad grade has had a demonstrable impact on fragmentation, as witnessed by the fact that Atlantic white cedar habitat is confined to the west side of the right-of-way, whereas the east side is nearly monotypic red maple. This attests to the effects of the grade on hydrology and the resultant vegetation that has emerged on either side over the past century. In addition, although current use of the corridor by pedestrians and ATVs is by no means as intense as a highway with motor vehicles, these uses do have a measurable impact on the ecology of the system – most notably through ATVs leaving the corridor and crossing through vernal pools and the Atlantic white cedar swamp, on circuitous or serpentine routes. These frequent uses of the existing grade itself also serve to maintain at least a partial canopy gap, particularly north of the existing power line and also adjacent to portions of the existing Raynham Park racetrack. The CAPS analysis does not account for these effects and instead assumes that Hockomock Swamp in its current condition is one unfragmented, continuous, uniformly intact habitat. Thus while it provides a measure of the potential benefits of the trestle, CAPS seemingly overestimates and overstates the existing ecological integrity of Hockomock and Pine swamps, and thus likewise overestimates the effects of South Coast Rail on ecological integrity.

4.14.3.5 Summary of Impacts by Alternative

Each of the alternatives evaluated in this chapter would have direct effects on biodiversity associated with the loss of natural, vegetated areas, particularly wetlands or areas within important wildlife habitats. These alternatives could also have indirect impacts, particularly from constructing new tracks or restoring abandoned or out-of-service rights-of-way. These alternatives also offer opportunities to improve wildlife passage and reduce fragmentation by reconstructing existing bridges or culverts.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would not impact natural communities or biodiversity.

Stoughton Electric Alternative

The Stoughton Electric Alternative includes improvements to existing active freight or rail lines from Canton Junction to Stoughton Station, and on the two Southern Triangle segments (the Fall River Secondary and New Bedford Main Line), as well as restoring out-of-service rail line from Stoughton Station to Longmeadow Street in Taunton. This alternative would include constructing a trestle through part of the Hockomock Swamp to reduce impacts to wetlands, biodiversity, and rare species.

Areas of concern for biodiversity impacts (north of the Southern Triangle) have been identified as the Bird Street Conservation Area in Stoughton, the Hockomock Swamp, and Pine Swamp. Potential impacts could include direct loss of habitat, fragmentation (either by creating a canopy gap or reducing the

ability of wildlife species, including state-listed rare species, to cross the rail bed), introduction of invasive species, or increased noise.

As shown in Table 4.14-29, the Stoughton Electric Alternative would result in the loss of approximately 182.27 acres of upland habitat and 12.3 acres of wetland habitat. This segment of the Stoughton Electric Alternative would increase habitat fragmentation (the existing rail bed, although out-of-service, has fragmented habitats and acts as a barrier to some organisms) within the Hockomock Swamp ACEC and the Pine Swamp. This barrier may affect several vernal pool complexes.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative would result in similar impacts to biodiversity as the Stoughton Electric Alternative. Because it would not require electrical power substations, the Stoughton Diesel Alternative would require 3.49 acres less upland habitat loss, and 0.01 acre less wetland habitat loss when compared to the Stoughton Electric Alternative.

Whittenton Electric Alternative

The Whittenton Alternative includes improvements to existing active freight or rail lines from Canton Junction to Stoughton Station, along the Attleboro Secondary through downtown Taunton, and on the two Southern Triangle segments (the Fall River Secondary and New Bedford Main Line), as well as restoring out-of-service rail line from Stoughton Station to Raynham Junction on the Stoughton Line and along the out-of-service Whittenton Branch in Raynham and Taunton. This alternative would include constructing a trestle through part of the Hockomock Swamp to reduce impacts to wetlands, biodiversity, and rare species.

Table 4.14-29 Stoughton Electric Alternative–Summary of Impacts

	Upland Habitat Loss	Wetland Habitat Loss	Fragmentation[1]	Vernal Pool Habitat Loss	Loss of Supporting Vernal Pool Upland Habitat[2]
Total	182.27	12.3	Yes	1.43	43.40

1 Stoughton Line north of Weir Junction to Raynham Junction.
2 Loss of supporting vernal pool upland habitat includes loss of buffer habitat defined as loss of forested wetland within 100 feet of VHP, and includes loss of upland habitat defined as upland habitat loss calculated for forested upland habitat between 100 and 750 feet of a vernal pool.

Areas subject to biodiversity impacts (north of the Southern Triangle) have been identified as the Hockomock Swamp, and the Bird Street Conservation Area in Stoughton. Potential impacts could include direct loss of habitat, fragmentation (either by creating a canopy gap or reducing the ability of wildlife species, including state-listed rare species, to cross the rail bed), introduction of invasive species, or increased noise.

As shown in Table 4.14-30, the Whittenton Electric Alternative would result in the loss of approximately 187.98 acres of upland habitat and 11.2 acres of wetland habitat. This segment of the Whittenton Electric Alternative would increase habitat fragmentation (the existing rail bed, although out-of-service, has fragmented habitats and acts as a barrier to some organisms) within the Hockomock Swamp ACEC. This barrier may affect several vernal pool complexes.

The Hockomock Swamp ACEC is the only ACEC that would be impacted by the Whittenton Alternatives. Approximately 0.14 acre of vernal pool habitat, 2.31 acres of buffer habitat, and 6.12 acres of upland habitat would be impacted within the Hockomock Swamp ACEC.

Table 4.14-30 Whittenton Electric Alternative–Summary of Impacts

	Upland Habitat Loss	Wetland Habitat Loss	Fragmentation[1]	Vernal Pool Habitat Loss	Loss of Supporting Vernal Pool Upland Habitat[2]	Other
Total	187.98	11.2	Yes	0.8	41.61	—

Stoughton Line north of Weir Junction to Raynham Junction.

1 Includes impacts (fill) to vernal pools and to any wetland area within 100 feet of the boundary of a vernal pool, where the pool is within a wetland.

2 Loss of supporting vernal pool upland habitat includes loss of buffer habitat defined as loss of forested wetland within 100 feet of VHP, and includes loss of upland habitat defined as upland habitat loss calculated for forested upland habitat between 100 and 750 feet of a vernal pool.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative would result in similar impacts to biodiversity as the Whittenton Electric Alternative. Because it would not require power substations, the Whittenton Diesel Alternative would require 4.11 acres less upland habitat loss, and 0.01 acre less wetland habitat loss, when compared to the Whittenton Electric Alternative.

The CAPS analysis evaluated the loss of IEI units (Index of Ecological Integrity) as a means of assessing the biodiversity effects of the alternatives. As shown in Table 4.14-31, the analysis compared the Stoughton Alternative north of Weir Junction with the Whittenton Alternative north of Weir Junction. The Whittenton Alternative would result in the direct loss of 0.1 IEI Unit more than the Stoughton Alternative, and would have a total indirect loss of IEI Units 7.2 more than the Stoughton Alternative. The CAPS analysis indicates that the Whittenton Alternative would have a greater effect on habitat connectivity and biodiversity than the Stoughton Alternative, in the segment that includes Pine Swamp.

Table 4.14-31 Loss of Index of Ecological Integrity Units

Segment	Excluding Common Route Units	Total Direct	Total Indirect
Stoughton Alternative (with trestle)	302.0	17.6	456.9
Whittenton Alternative (with trestle)	309.3	17.7	464.1
Difference	7.3	0.1	7.2

Comparison of Alternatives

A comparison of the effects of the South Coast Rail alternatives on biological diversity (plant, wildlife and fish communities and habitats) is shown in Table 4.14-32. As discussed in detail in Section 4.14.3.2 of this chapter, all Build Alternatives would result in the loss of upland habitat, wetland habitat, and vernal pool habitat (including direct and indirect impacts to vernal pools as well as supporting upland habitat used by vernal pool amphibians). All Build Alternatives, would result in habitat fragmentation and would create or exacerbate a barrier to wildlife movement.

Table 4.14-32 Summary of Environmental Consequences

Alternative	Upland Habitat Loss	Wetland Habitat Loss	Fragmentation	Vernal Pool Habitat Loss	Loss of Supporting Vernal Pool Upland Habitat
Stoughton Electric	182.27	12.3	Yes	1.43	43.40
Stoughton Diesel	178.78	12.3	Yes	1.43	43.40
Whittenton Electric	187.98	11.2	Yes	0.8	41.61
Whittenton Diesel	183.87	11.2	Yes	0.8	41.61

Stoughton Line north of Weir Junction to Raynham Junction.

Notes: Includes impacts (fill) to vernal pools and to any wetland area within 100 feet of the boundary of a vernal pool, where the pool is within a wetland.
Loss of supporting vernal pool upland habitat includes loss of buffer habitat defined as loss of forested wetland within 100 feet of VHP, and includes loss of upland habitat defined as upland habitat loss calculated for forested upland habitat between 100 and 750 feet of a vernal pool.
Diesel Alternative would result in 0.03 acre less wetland habitat loss for both the Stoughton and Whittenton Alternatives.

The Whittenton Alternative would have less wetland loss (11.2), and the least impacts to vernal pool wetland habitat (0.8 acre).

Each of the rail alternatives would result in habitat fragmentation and associated indirect effects on natural communities. The Stoughton Alternatives would fragment wetland and upland communities, particularly through the Hockomock Swamp and Pine Swamp, although the barrier effect would be reduced by constructing a trestle. The Whittenton Alternatives would fragment wetland and upland communities, particularly through the Hockomock Swamp and along the Whittenton Branch, although the barrier effect would be reduced by constructing a trestle in the Hockomock Swamp.

4.14.3.6 Mitigation

This section discusses strategies and measures that could be used to mitigate for impacts to biological diversity. Although there are no state or federal regulatory programs that establish mitigation requirements for impacts to biological diversity, the discussion below considers whether impacts to biodiversity could be avoided or minimized, and whether mitigation measures could be incorporated into the alternatives to mitigate for unavoidable impacts. No mitigation is proposed specifically for impacts to non-regulated plant, wildlife or fish communities. Mitigation for impacts to regulated resources such as wetlands, waterways, and threatened and endangered species would incorporate measures to protect and enhance the biodiversity of these resources.

Avoidance

Avoidance evaluates whether there are alternatives, or modifications to alternatives, that would avoid impacts to biodiversity.

No-Build Alternative

The No-Build Alternative, because it does not require any new construction, would avoid any impacts to plant communities, wildlife, or fisheries.

Stoughton Alternatives

The Stoughton Electric and Stoughton Diesel Alternatives require several construction elements that would impact plant communities, wildlife, or aquatic communities. Restoring the out-of-service Stoughton Line will adversely affect plant and wildlife communities, particularly in the Hockomock Swamp and Pine Swamp. The Stoughton Alternatives use the existing New Bedford Main Line and Fall River Secondary to reduce impacts to natural communities. Minor losses of vegetation and wildlife habitat along the edges of these existing rail lines cannot be avoided if the tracks are upgraded to current standards.

Whittenton Alternatives

The Whittenton Electric and Whittenton Diesel Alternatives require several construction elements that would impact plant communities, wildlife, or aquatic communities. Restoring the out-of-service Stoughton Line and Whittenton Branch will adversely affect plant and wildlife communities, particularly within the Hockomock Swamp. The Whittenton Alternatives use the existing Attleboro Secondary, New Bedford Main Line and Fall River Secondary to reduce impacts to natural communities. Minor losses of vegetation and wildlife habitat along the edges of these existing rail lines cannot be avoided if the tracks are upgraded to current standards.

Station Sites and Layover Facility Sites

Station and layover facility sites were selected to avoid impacts to sensitive biological resources, as documented in Chapter 3. Station and layover sites were placed in previously-developed upland areas wherever feasible. Where a previously-developed site was not available, these facilities were sited in upland areas that did not contain sensitive or uncommon plant communities, mapped rare species habitats, or vernal pools. Stations and layovers were located to avoid construction in unfragmented forest habitats.

Minimization

Where avoidance is not possible, impacts would be minimized to the best extent practicable. Measures to minimize direct and indirect impacts to biodiversity (plant, wildlife, and aquatic communities) will be developed as part of the mitigation for impacts to wetlands, threatened and endangered species, and water resources. In addition to other minimization measures not yet identified, these measures would include:

- Adjusting the grading to reduce the loss of plant or wildlife communities.
- Evaluating all culverts to determine whether replacing a culvert could adversely impact, or benefit, biodiversity.
- Using retaining walls to reduce the loss of unique natural communities.
- Replanting disturbed areas.
- Developing and implementing an invasive species control plan.

The Stoughton and Whittenton Alternatives were designed with specific measures to minimize habitat fragmentation. Both the Stoughton and Whittenton Alternatives include the proposed Hockomock

trestle, extending for approximately 8,500 feet. The trestle would maintain habitat connectivity for small terrestrial and aquatic vertebrates and other wildlife and thus minimize impacts to biodiversity. The Whittenton Alternative would further minimize impacts to biodiversity by avoiding the Pine Swamp area in Raynham, which would be crossed by the Stoughton Alternative.

Specific Mitigation Measures

Measures to mitigate for unavoidable direct and indirect impacts to biodiversity (plant, wildlife, and aquatic communities) will be developed for the least environmentally damaging practicable alternative (LEDPA). Specific measures to mitigate for impacts to state-listed rare species are described in Chapter 4.15, *Threatened and Endangered Species.* These measures are anticipated to benefit a wide range of species in addition to the targeted species (Blanding's turtle, eastern box turtle, blue-spotted salamander). The wildlife crossings constructed along the MBTA's Greenbush Line have been shown to be used by numerous species, reducing the barrier effect of the rail.[73] Specific measures to mitigate for impacts to wetlands would be designed to enhance the ability of wetlands to provide wildlife habitat, protect fisheries, and provide aquatic habitat. In addition to other mitigation measures not yet identified, these measures could include:

- Constructing wildlife crossings.
- Enhancing or replacing habitat.
- Preserving important habitat areas.
- Developing construction phasing schedules to protect species.

Each of the alternatives presents opportunities to improve wildlife habitat, particularly by reconstructing existing culverts or bridges to improve wildlife or fish passage and reduce fragmentation. In addition, the CAPs model can be used as a tool to contribute to the optimization of mitigation by enhancing the area of land with high IEI values and connectedness.

Fisheries

With the exception of the Taunton River and Cedar Swamp River bridges, all of the existing bridges are single-span bridges supported on stone abutments. Most of these bridges will be replaced by installing new abutments behind (landward) of the existing abutments to widen the bridge opening and provide an upland shelf for wildlife passage. Some replaced bridges will use new abutments at existing abutment locations. In-water work is restricted to removing the existing abutments and adding riprap, if necessary to stabilize the new shoreline. Erosion and sediment controls will be used to protect water quality. The Taunton River and Cedar Swamp River Bridges are multi-span bridges supported by steel pilings or piers in the river. Replacing these bridges will require that the new abutments be replaced by installing new abutments behind (landward) of the existing abutments to widen the bridge opening and provide an upland shelf for wildlife passage. New piers or pilings will be installed to support the new bridge structure, and the existing pilings will be removed. At the current conceptual design stage, it has not

[73] Pelletier SK, Carlson L, Nein D and Roy RD. 2006. Railroad crossing structures for spotted turtles: Massachusetts Bay Transportation Authority– Greenbush rail line wildlife crossing demonstration project. IN: Proceedings of the 2005 International Conference on Ecology and Transportation, Eds. Irwin CL, Garrett P, McDermott KP. Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: pp. 414-425.

been determined if new pilings would be driven (from cranes located on shore or on barges) or if coffer dams would be required to install caissons. In-water work would be required for these bridges, as well as the in-water work needed to remove the existing abutments and add riprap, if necessary to stabilize the new shoreline. Erosion and sediment controls, including in-water sediment booms, will be used to protect water quality.

With the exception of the Taunton River, the applicant will generally be expected to observe the TOY restrictions recommended by the DMF for in water work as shown in Table 4.14-33. In general, these TOY restrictions would preclude in-water work from March 15 to June 30. Work outside of the waterway (on the bridge superstructure or on the new abutments) would not be subject to TOY restrictions. No TOY restrictions would be applicable to the Rattlesnake Brook bridge, which crosses over Route 24 (Rattlesnake Brook is below Route 24) or to Queset Brook, where bridge work would replace the superstructure only. DMF's suggested TOY restrictions for the Taunton River would allow only a 2-month, winter, work period for reconstruction of each of the four Taunton River bridges. This short construction period does not allow sufficient time to complete the installation of bridge supports. The applicant will coordinate with DMF to identify TOY restrictions and/or construction methods for the Taunton River that is adequate to protect fish spawning while allowing bridge construction to be completed.

Table 4.14-33 Massachusetts Division of Marine Fisheries-Recommended Time-of-Year Restrictions on In-Water Work

Waterway	Proposed Construction	Diadromous Fish Species	Time of Year Restriction
Assonet River	Reconstruct bridge – replace abutments to provide wider opening for fish and wildlife	Alewife, American eel, blueback herring, rainbow smelt, white perch	Jan. 15 to Nov. 15
Cedar Swamp River	Reconstruct two bridges – replace abutments to provide wider opening for fish and wildlife	American eel	March 15 to June 30
Cotley River	Reconstruct bridge – replace abutments to provide wider opening for fish and wildlife	American eel	March 15 to June 30
Fall Brook	Reconstruct bridge – replace abutments to provide wider opening for fish and wildlife	Alewife, American eel, blueback herring, white perch	March 15 to June 30, Sept. 1 to Nov. 15
Terry Brook Pond	Replace culvert to maintain hydrology and improve fish passage	American eel	March 15 to June 30
Black Brook	Construct new bridge (where old culvert washed out); replace 2 culverts. Design to improve fish passage.	American eel	March 15 to June 30
Mill River	Reconstruct bridge – replace abutments to provide wider opening for fish and wildlife	Alewife, American eel, blueback herring	Feb. 15 to June 30, Sept 1 to Nov. 15
Pine Swamp Brook	Reconstruct bridge – replace abutments to provide wider opening for fish and wildlife	American eel	March 15 to June 30
Rattlesnake Brook	Replace bridge over Route 24, no work in or adjacent to water	Alewife, American eel, blueback herring, rainbow smelt	None required – no work in water.

Waterway	Proposed Construction	Diadromous Fish Species	Time of Year Restriction
Queset Brook	Reconstruct bridge – retain existing historic abutments	American eel	None required – no work in water
Taunton River	Reconstruct four bridges – replace abutments to provide wider opening for fish and wildlife, reduce number of piers in the waterway.	Alewife, American eel, American shad, Atlantic sturgeon, blueback herring, rainbow smelt, white perch	Jan. 15 to Nov. 15
Whitman Brook	Reconstruct bridge – replace abutments to provide wider opening for fish and wildlife	American eel	March 15 to June 30

Breeding Bird Diversity

The National Migratory Bird Treaty is cited in the Secretary's Certificate as the trigger for mitigation measures to protect nesting birds. The Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712, as amended) states that, unless permitted by regulations, it is illegal to "pursue, hunt, take, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer for purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time or in any manner, any migratory bird, included in the terms of this Convention … or any part, nest, or egg of such bird." As the U.S. Fish and Wildlife Service (USFWS) states, "we regulate most aspects of the taking, possession, transportation, sale, purchase, barter, exportation, and importation of migratory birds."

The USFWS does not, through the Migratory Bird Treaty Act, explicitly prohibit or regulate the incidental take of birds, bird nests, or bird eggs caused by land clearing. However, in response to the Secretary's Certificate, the applicant will not undertake vegetation removal in critical areas (Pine Swamp, Hockomock Swamp, Assonet Swamp, Acushnet Swamp) during the nesting season for migratory birds (May 1 through July 15).

Vernal Pools

Impacts to vernal pools and to their associated habitat created by the South Coast Rail project include direct fill of some vernal pools and decreases in vernal pool habitat, buffer habitat, and surrounding upland habitat. This section summarizes the potential avoidance, minimization, and mitigation measures to offset the impacts to vernal pools. During final design, additional field data will be collected to determine whether Potential Vernal Pools actually support breeding pool species, better define the limits of actual breeding pools, and refine the potential to make existing pools larger or create new pools near those it be impacted.

Avoidance—One of the most practicable ways to avoid impacts, particularly at locations where direct fill to vernal pools is small, is by slope modification in the final design phase of the project. Slope modification could include redesign of grading to create steeper slopes, including retaining walls, or a combination of both.

One of the largest avoidance measures of the South Coast Rail project is the trestle portion of rail (approximately 8,500 feet long) over the majority of Hockomock Swamp. The trestle would avoid direct

and indirect impacts to 9 vernal pools in Easton. In addition, the trestle would avoid impeding wildlife, including small amphibians, moving between pools across the existing berm. The trestle will avoid fragmentation of two clusters of pools in Easton: a cluster of five pools (CVPs 1660 through 1664) at the northern edge of the Hockomock Swamp area, and an additional cluster of three pools (CVPs 1665 and 1710, NHESP 2) just to the north of the first cluster.

Minimization—Where avoidance is not possible, impacts would be minimized to the maximum extent practicable. Minimization efforts generally employ the same strategies as avoidance; final design for the project would include some of the same design elements to minimize impacts such as steeper slopes and retaining walls where practicable.

Wildlife Passage—One of the most effective ways to mitigate for habitat fragmentation caused by constructing new tracks and widening existing berms is to construct wildlife crossings and replace existing culverts to allow for the passage of small amphibians across the right-of-way. These wildlife crossings and culvert upgrades can help to reconnect pools that are likely to experience fragmentation from a larger cluster of pools, such as VP 13 in Easton (Figure 4.14-7c). Wildlife crossings and culvert upgrades can also serve to reestablish former connectivity between areas where existing culverts have failed or collapsed, such as between EA-1 and EA-2 in Easton (Figure 4.14-7c). Crossings would be placed in areas where habitat fragmentation is most likely to occur, at or near areas where clusters of vernal pools exist.

Protection—Potential mitigation measures also include purchasing land containing vernal pools or placing a conservation restriction on land containing vernal pools. These areas, as well as any associated vernal pool habitat, buffer habitat, and surrounding upland habitat, would be protected from further encroachment by these measures. This type of mitigation would likely be most effective if a cluster or highly active area of vernal pools were purchased or placed under protection. For example, a cluster of vernal pools in Easton is present on land owned by the Southeastern Regional Vocational Technical High School; this cluster includes pools CVPs 1660, 1664, and 1661. Land on the opposite side of the right-of-way is owned by the Town of Easton and includes CVPs 1663 and 1662. Another cluster of pools including PVP 7222, CVP 2152, PVP 7233, and VP 10 is present in North Easton on land under private ownership. The applicant will work with these adjacent landowners to protect vernal pools adjacent to the right-of-way at these locations through conservation restrictions or similar measures.

Protecting existing vernal pool areas can also come through discouraging public abuse of the area. Impacts to vernal pools along the right-of-way are currently occurring as a result of human use of the right-of-way, particularly on abandoned portions of track. Human traffic along trails around vernal pool areas can affect the use of pools by obligate vernal pool species. In particular, ATV users ride through vernal pool areas late in the season when the pools become shallower and begin to dry out. This can increase mortality both of the developing young amphibians in the pool and juveniles leaving the pool. Much of this ATV use occurs along the abandoned portion of track in Easton. The trestle will discourage ATV riders from using that portion of the berm, since the physical presence of the trestle will make riding along that section of the berm impossible. ATV use has also damaged vernal pools on the Southeastern Regional School and Town of Eason land south of Foundry Street. The applicant will work with these landowners to identify protection measures, potentially including fencing, to protect these pools.

Habitat Enhancement—Impacts to vernal pools and their associated habitats can also be mitigated by enhancing remaining habitats and creating new habitats. For pools that are filled completely, new pools

can be created, where feasible, in nearby areas. For example, VP 13 in Taunton lies in the right-of-way and would be completely filled. The two adjacent parcels on either side of the right-of-way consist of undeveloped land under the same private ownership. As with placing existing pools under protection, the applicant would work with adjacent landowners to identify and pursue constructing these replacement areas where appropriate.

Properly-constructed vernal pools will replicate the hydrology and functions of a filled pool in most cases,[74] and field techniques exist for simulating hydrological conditions when constructing pools, such as through the use of liners in more permeable soils.[75] The substrate of the vernal pool to be filled contains much of the organic matter that supports the food web associations of the pool. When creating a new vernal pool, the substrate of the existing pool can be taken from the pool before it is filled and transplanted to the new pool to aid in its establishment.

Expansion of existing vernal pools that would receive fill is one potential option for mitigating vernal pool impacts. Conceptually, vernal pool enlargement would expand the area of potential breeding habitat for vernal pool species including individual animals displaced by the fill. However, creating the expanded area would require either the disturbance (at least temporarily) of additional vernal pool habitat wetlands, or existing upland buffer. In addition, it would be necessary to ensure that vernal pools are constructed/expanded well-removed from developed areas where vernal pool species are more susceptible to predation by raccoons and domesticated animals. In general, it is expected that this option would be applied on a limited basis, and that the resulting constructed vernal pools would be closely monitored to ensure their ultimate success as viable habitats for vernal pool-dependent fauna.

Plantings around pools can help maintain healthy vernal pool ecosystems. New shrub and tree plantings in areas where pools would receive impact would help native vegetation reestablish itself. Once mature, areas of plantings would contribute additional leaf litter and other detrital inputs, and would help shade the pool and regulate its temperature. Plantings would be especially appropriate in areas where the existing surrounding vegetation contains invasive or other low-value species, such as purple loosestrife or common reed. These areas would benefit from plantings that would return the area to a more natural vernal pool habitat such as a red maple swamp, shrub swamp, or emergent marsh. As a possible example, VP 10 in Easton (Figure 4.14-7b) is a vernal pool that would receive direct fill, but that has both upland and wetland habitats adjacent to it and within 100 feet of its boundary. The wetland area surrounding VP 10 is a forested wetland associated with Whitman Brook to the south. Plantings at the edge of disturbance of this pool consistent with a forested wetland – for example, red maple would be potentially appropriate. Plantings would need to be consistent with vegetation management policies maintained by the railway operators. For example, trees should not be planted at the edge of a berm where, when mature, they would encroach upon the right-of-way. In the example of VP 10 above, as an alternative to red maple trees, areas at the edge of the right-of-way could be planted with native shrubs such as buttonbush (Cephalanthus occidentalis) to enhance the habitat of the area.

[74] De Weese, J.M. Vernal Pool Construction Monitoring Methods and Habitat Replacement Evaluation. *Ecology, Conservation, and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference*. California Native Plant Society, Sacramento, CA, 1998 pp. 217-223.

[75] Biebighauser, T.R. 2002. *A Guide To Creating Vernal Ponds*. USDA Forest Service.

Fish and Wildlife Passage

This section describes the methodology for assigning mitigation and the recommended mitigation measures to enhance biodiversity by improving certain South Coast Rail bridges and culverts to facilitate wildlife and fish passage through the railroad bed.

Types of Wildlife and Fish Crossings—Wildlife and fish crossings vary according to the species addressed and the physical characteristics of the crossing locations. Wildlife, being more broadly mobile than fish, can use a wide range of crossing types. Depending on an animal's mobility, it may cross directly over the tracks unimpeded (but at risk for collision with trains), cross over tracks on overpasses, or cross under the tracks at bridge, culvert or trestle locations. Physical size or behavioral characteristics can affect animals' ability to use these crossings. Large mammals such as deer are unable to fit through small structures or those filled with water, and generally unwilling to enter structures that they cannot see through. Overpasses or large-opening underpasses are the best types of crossings for these animals. Small reptiles such as turtles may be blocked by rails (or become trapped between two rails) or unable to negotiate culverts with rapidly flowing water. Culverts that duplicate natural stream conditions, or tunnels that provide dry passage, are the best types of crossings for these animals. Between-tie open-top crossings at the ground surface may allow trapped reptiles to escape. Drift fences may prevent direct track crossing or guide turtles and other animals to crossing locations.

Fish are constrained to rivers, streams, and ponds, and therefore must use crossings that convey water through or under the railroad bed (e.g., culverts or bridges) at appropriate depths and flow rates. Culverts that mimic up- and downstream conditions of slope, substrate, and water volume provide the best crossings through the railroad bed for fish. Bridges do not typically affect fish passage.

Numerous guidance documents about structures that facilitate fish and wildlife passage across linear facilities (whether roads or railroads) have been prepared by or for federal and state fish and wildlife, land management, and transportation agencies. The *Massachusetts River and Stream Crossing Standards,* [76] developed by a partnership of agencies and other stakeholders, are most applicable to the bridges and culverts along the Stoughton Alternative. The *Wildlife Crossing Structure Handbook* [77] (the Handbook) provides guidance on amphibian tunnels and drift fences that is useful for between-tie structures. Guidelines for bridges and culverts, tunnels, and drift fences from these sources are summarized in the next sections. Wildlife overpasses have generally been used more frequently in the west, and are not appropriate for the South Coast Rail project because large mammals (moose, elk, bighorn sheep) are not present and wildlife that are present can use culverts or bridges, or cross tracks directly with little danger from the infrequent South Coast Rail trains.

[76] River and Stream Crossing Partnership. 2011. *Massachusetts River and Stream Crossing Standards*. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

[77] US Federal Highway Administration. 2011. *Wildlife Crossing Structure Handbook: Design and Evaluation in North America*. Publication No. FHWA-CFL/TD-11-003. Lakewood, CO: US Department of Transportation, Federal Highway Administration, Central Federal Lands Highway Division.

River and Stream Crossing Standards for Bridges and Culverts—The Massachusetts River and Stream Crossing Standards[78] (the Standards) are intended for fish-bearing streams but can be applied to other areas where wildlife species that use riparian habitat are present. The Standards seek to achieve:

- fish and other aquatic organism passage;
- river and stream continuity; and
- wildlife passage.

The Standards state that full "aquatic organism passage" is achieved when a crossing allows unrestricted movement of all aquatic organisms indigenous to the water body. "Aquatic organism" means fish and the aquatic life stages of other vertebrates (amphibians), and aquatic invertebrates including small benthic fauna that typically reside within the stream substrate. "Unrestricted movement" means that all individuals and all life stages are able to move through the structure as freely as they can through the natural stream channel and without delays or obstructions caused by the crossing structure. Crossing structures that achieve full aquatic organism passage are expected to maintain natural river hydrology and transport sediment and woody debris.

The Standards acknowledge that it is impractical to use a species-based approach for designing stream crossings because the ideal design for one species may differ from the ideal for another species occupying the same habitat. It is more practical to recreate natural stream conditions and allow resident species to use the crossing as if it were an unaltered segment of the stream. The Standards therefore use a "Stream Simulation" [79] approach for crossing design. According to the Standards,

> "Stream Simulation is an ecosystem-based approach that focuses on maintaining the variety and quality of habitats, the connectivity of river and stream ecosystems, and the essential ecological processes that shape and maintain these ecosystems over time. Stream Simulation is a design approach that avoids flow constriction during normal conditions and creates a stream channel that maintains the diversity and complexity of the streambed through the crossing. Crossing structures that avoid channel constriction and maintain appropriate channel conditions (channel dimensions, banks, bed, and bed forms) within the structure should be able to accommodate most of the normal movements of aquatic organisms, and preserve (or restore) many ecosystem processes that maintain habitats and aquatic animal populations. The goal is to create crossings that are essentially "invisible" to aquatic organisms by making them no more of an obstacle to movement than the natural channel."

General or Optimum standards are provided to balance the cost and logistics of crossing design with the degree of river/stream continuity warranted in areas of different environmental significance. General standards are applicable for crossings on rivers or streams (including intermittent streams) serving as habitat for fish and semi-aquatic wildlife that typically live within stream channels (salamanders, turtles). These crossings should at least pass most fish species, maintain river/stream continuity, and facilitate passage for some wildlife. The Optimum standards are applicable for stream crossings in areas

[78] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

[79] US Forest Service. 2008. *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings.* Available on the internet at http://www.stream.fs.fed.us/fishxing/aop_pdfs.html.

of particular statewide or regional significance for their contribution to landscape level connectedness. In addition to the aquatic species benefits provided by the General standards, the Optimum standards better accommodate terrestrial wildlife.

The General standards are:

- Spans (bridges, 3-sided box culverts, open-bottom culverts or arches) that preserve the natural stream channel are strongly preferred over structures with a closed bottom.
- If the crossing is a box culvert (with a closed bottom), then it should be embedded:
  - A minimum of 2 feet below the substrate for all culverts, and
  - A minimum of 2 feet below the substrate and at least 25 percent of the total area for round pipe culverts.
- When embedment material includes elements greater than 15 inches in diameter, embedment depths should be at least twice the D84 (particle width larger than 84 percent of particles) of the embedment material.
- The structure should span the channel a minimum of 1.2 times the bankfull width in order to avoid channel constriction during normal bankfull flows. The bankfull width should be measured at straight sections of the channel outside the influence of existing structures and unusual channel characteristics.
- The substrate within the structure should match the characteristics of the substrate in the natural stream channel (mobility, slope, stability, confinement) at the time of construction and over time as the structure has had the opportunity to pass significant flood events.
- The structure floor should be designed with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows.
- The structure should have an openness ratio of greater than 0.82. The openness ratio is the cross-sectional area of a structure opening divided by its length. For structures with multiple cells or barrels, openness is calculated separately for each cell or barrel, at least one of which should meet the appropriate openness standard. The embedded portion of a box culvert is not included in the calculation of cross-sectional area for determining openness.
- Banks should be present on each side of the stream matching the horizontal profile of the existing stream and banks. All constructed banks should have a height to width ratio of no greater than 1:1.5 (vertical: horizontal) unless the stream is naturally incised. The banks should be designed and constructed so as not to hinder riverine wildlife use of the streambed and banks for passage.

The Optimum standards' application to areas of particular statewide or regional significance recognizes their contribution to landscape level connectedness. The Optimum standards define these significant areas as including rivers or streams and associated riparian areas that serve as corridors or connecting habitat-linking areas of significant habitat (greater than 250 acres) in three or more towns. Although not

directly comparable to the IEI values represented by the CAPS analysis, the Optimum standards' concept of significant areas as large tracts of minimally altered landscapes is similar. The Optimum standards have three modifications of the General standards:

- Bridges are specified, instead of open spans. (The "embedded culvert" standard is omitted from the Optimum standards, as it is not needed for bridges.)
- A minimum height of 8 feet (2.4 meters) and openness ratio of 2.46 should be maintained if conditions are present that significantly inhibit wildlife passage (high traffic volumes, steep embankments, fencing, Jersey barriers or other physical obstructions). If conditions that significantly inhibit wildlife passage are not present, a minimum height of 6 feet (1.8 meters) and openness ratio of 1.64 should be maintained.
- Banks should be present on each side of the stream matching the horizontal profile of the existing stream. The portion of the structure over the banks should have sufficient headroom to provide dry passage for semi-aquatic and terrestrial wildlife.

Both the General and Optimum standards are applicable for constructing new and replacing existing culverts and bridges, depending upon the landscape as described above. Culvert replacement offers a better opportunity to integrate the Standards. The Standards' recommendations for replacing existing culverts are summarized in the following paragraphs.

Replacement culverts should meet the design guidelines for either General standards or Optimum standards unless:

- Doing so would result in significant stream instability that cannot otherwise be mitigated;
- Meeting the Standards would create a flooding hazard that can't otherwise be mitigated; or
- Site constraints make it impossible to meet the Standards.

If it is not possible to meet all of the applicable Standards, replacement crossings should be designed to avoid or mitigate the following problems:

- Inlet drops – occur where water level drops suddenly at an inlet, causing changes in water speed and turbulence. In addition to the higher velocities and turbulence, these jumps can be physical barriers to fish and other aquatic animals when they are moving upstream and are unable to swim out of the culvert.
- Outlet drops – occur when water drops off or cascades down from a structure outlet, usually into a receiving pool. This may be due to the original culvert placement, erosion of material at the area immediately downstream of the culvert, or downstream channel adjustments that may have occurred subsequent to the culvert installation. Outlet drops are barriers to fish and other aquatic animals that can't jump to get up into the culvert.
- Flow contraction that produces significant turbulence – occur when a culvert or other crossing structure is significantly smaller than the stream width the converging flow creates a condition called "flow contraction." The increased velocities and turbulence associated

with flow contraction can block fish and wildlife passage and scour bed material out of a crossing structure. Flow contraction also creates inlet drops.

- Tailwater armoring – consist of concrete aprons, plastic aprons, riprap or other structures added to culvert outlets to facilitate flow and prevent erosion.

- Tailwater scour pools – are created downstream from high flows exiting the culvert. The pool is wider than the stream channel and banks are typically eroded. Some plunge pools may have been specifically designed to dissipate flow energy at the culvert outlet and control downstream erosion.

- Physical barriers to fish and wildlife passage – these barriers include any feature that physically blocks fish or wildlife movement through a crossing structure as well as features that would cause a crossing structure to become blocked. Beaver dams, debris jams, fences, sediment filling a culvert, weirs, baffles, aprons, and gabions are examples of structures that might be or cause physical barriers. Weirs are short dams or fences in the stream that constrict water flow or fish movements. Baffles are structures within culverts that direct, constrict, or slow down water flow. Gabions are rectangular wire mesh baskets filled with rock that are used as retaining walls and erosion control structures. Steeply sloping channels within a structure resulting in shallow flows and/or high velocity flows can also inhibit movement of fish and other aquatic organisms.

Other design guidelines for replacing culverts are:

- Avoid pipes that are too smooth (as defined by the Standards) so as to facilitate upstream migration of aquatic organisms.

- As indicated by long profiles, scour analyses, and geomorphological assessments, design the structure and include appropriate grade controls to ensure that the replacement will not destabilize the river/stream.

- To the extent practicable conduct stream restoration upstream and/or downstream of the structure as needed to restore river/stream continuity and eliminate barriers to aquatic organism movement.

Guidelines for Other Crossing Structures—Tunnels (similar to small culverts but without a hydrologic function) and between-tie crossings provide crossing opportunities for small mammals, reptiles, and amphibians in upland locations where culverts or bridges are not located. Between-tie crossings also allow animals that become entrapped between rails to enter the structure and escape underneath the rails.

Reptiles and amphibians have special requirements for wildlife crossing design since they are unable to orient their movements to locate tunnel or between-tie crossing entrances. Drift fences play a critical function in intercepting amphibians and reptiles, directing them to the crossing structures. The Handbook provides guidance on tunnel and drift fence design for structures underneath roadways; the guidelines, as adapted for railroad beds and applied to between-tie crossings, are:

- Large tunnels provide good airflow and natural light conditions for reptiles and amphibians to pass through in a natural-appearing environment.

- Tunnels and between-tie crossings should be sited in known routes of seasonal migration, dispersal or other movement events for the target species. Reptiles and amphibians are not likely to use these structures unless they are located in migratory routes, within preferred habitat, or in general area where dispersal events may occur.

- Continuous habitat or vegetative cover leading to the structure should be provided. The area may need to be re-vegetated after construction to restore habitat conditions and provide important cover during migrations and other movement events.

- The floors of the structures should be covered with native soil (sandy loam if possible) to provide a more natural substrate for travel, placed in continuity with the ground surface in the area. In migration route areas, the distance between tunnels or between-tie crossings should be 150 feet (45 meters) or less, but a 200 foot (60 meter) distance could be used if drift fences are funnel-shaped to guide amphibians to the structure, as described in the following section. The structures should be level and designed to conform to local topography, but drainage should be directed away from the structures to prevent flooding within.

- Tunnels may be rectangular or circular in cross-section; between-tie crossings are rectangular in cross-section. Prefabricated rectangular and square/box designs are preferred because vertical walls facilitate the movement of amphibians and reptiles through the structure. Pipes are not desirable because the animals may attempt to climb the slope of the wall instead of proceed through the structure. The cross-section of an amphibian and reptile tunnel should increase with tunnel length, as recommended in Table 4.14-34. Surface materials may be prefabricated concrete or polymer. Metal is not desirable because of its high thermal conductivity and resulting coldness, especially during spring migratory periods.

Table 4.14-34 Tunnel Dimension Recommendations

	Tunnel Length (feet)				
Type	**<65**	**65-100**	**100-130**	**130-165**	**165-200**
Rectangular (width X height)	3.2 X 2.5	5.0 X 3.2	5.75 X 4.0	6.5 X 5.0	7.5 X 5.75
Circular (diameter)	3.2	4.5	5.25	6.5	8.0

Source: US Federal Highway Administration. 2011. Wildlife Crossing Structure Handbook: Design and Evaluation in North America.

- Between-tie crossings are open-top to allow animals trapped between rails to escape underneath the rails in a 7- to 8 inch deep trough. These structures should be rectangular and include a natural material bottom. The dimensions of between-tie crossings are constrained by the distance between the ties and limited to the length of the ties.

- Funneling walls of limited length should be constructed to direct animals to between-tie crossings. Lengthy drift fences (as described below) would not be associated with between-tie crossings; there would be a risk that animals could get trapped between the drift fence and the rails. For the same reason, between-tie crossings would not be installed where drift fences are associated with tunnels or culverts.

Recent experience on the MBTA's Greenbush Line provides insight on between-tie crossing value for turtles. In association with the Greenbush Line Commuter Railroad Restoration Project, the MBTA initiated a demonstration project in spring of 2003 to determine the effectiveness of a proposed railroad crossing structure in an urbanized landscape.[80] Three identical, open-air prototypes were positioned in the right-of-way of a former railroad bed between adjacent wetlands known to support turtles. Each structure was linked with temporary funneling barriers along the track edges.

To evaluate the effectiveness of the structures, remote photographic stations were established at each crossing, and radio telemetry was used to track turtle movements. Study results demonstrated that turtle crossing patterns and frequency through the right-of-way during the monitoring period were similar to those prior to when the barrier was constructed. The crossings were also used by other wildlife species, including reptiles (eastern garter snake [*Thamnophis sirtalis*]) , amphibians (green frog [*Rana clamitans*]), birds (wood duck [*Aix sponsa*], mallard [*Anas platyrhynchos*]), and mammals (coyote [*Canis latrans*], gray fox [*Urocyon cinereoargenteus*] , muskrat [*Ondatra zibethicus*], longtailed weasel [*Mustela frenata*], eastern cottontail [*Sylvilagus floridanus*], raccoon, striped skunk [*Mephitis mephitis*], opossum [*Didelphis virginiana*], eastern grey squirrel [*Sciurus carolinensis*], eastern chipmunk [*Tamias striatus*], mouse species). The demonstration project concluded that the location and design of the crossing structures provided an effective means of maintaining habitat connectivity for a variety of wildlife species, including turtles (spotted, snapping, and painted turtles). As part of the Conservation and Management Plan developed for the Greenbush Line, 45 wildlife crossing structures, with funneling walls, were installed at key locations along the right-of-way. The type of crossing structure used on the Greenbush Line is largely open to ambient conditions and, therefore, most effective in mimicking the natural conditions typically encountered by turtles (e.g., substrate, moisture, temperature, light).

Guidelines for Drift Fences—Drift fences are used to prevent small animals (reptiles and amphibians in particular) from entering the track area and to direct them to crossing locations. The following design guidelines offered by the Handbook have been adapted to the specific characteristics of a railroad such as the South Coast Rail.

- Drift fences should be installed at the base of the railroad bed slope, tied into the culvert or tunnel entrance and avoiding any surface irregularities that might impede or distract movement towards the entrance.
- Wing walls should angle out from each end of the culvert or tunnel at approximately 45 degrees to orient animals that move away from the structure towards natural environment.
- Drift fences should be 1.25 feet (0.4 meter) high and must be entirely opaque, of smooth fabric (rigid plastic, polythene, canvas) and with vertical walls. Fences made of translucent material or wire mesh are not recommended because some amphibians try to climb over them instead of moving towards the structure. Bowed or curved walls can obstruct the travel of some amphibians moving towards the structure. Stakes should be placed on the railroad side of the drift fence and not the opposite, which would obstruct amphibian movement.

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[80] Pelletier SK, Carlson L, Nein D and Roy RD. 2006. Railroad crossing structures for spotted turtles: Massachusetts Bay Transportation Authority– Greenbush rail line wildlife crossing demonstration project. IN: Proceedings of the 2005 International Conference on Ecology and Transportation, Eds. Irwin CL, Garrett P, McDermott KP. Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: pp. 414-425.

- To prevent breaching by climbing amphibians and reptiles, fence designs that are concave or create an overhang or lip have been used successfully. Fencing should be clear of obstructions and vegetation. Overhanging vegetation close to the fence has resulted in animals climbing over the fence onto the railroad.

The bottom section of the drift fence should be secured to ground, not leaving any gaps.

Methodology for Assigning Mitigation—Each of the bridge and culvert locations was reviewed to determine the ecological value of the passage and the suitability of applying the Standards and other mitigation measures, taking into consideration the engineering constraints described previously for the proposed bridge and culvert replacements. The proposed mitigation measures for the bridges considered in this evaluation were assigned based on the structure's location over water or over land. As described previously, bridges over water would be replaced to meet the Standards unless site-specific constraints prevent, while bridges over land would be replaced in kind.

The broad range of culvert locations warranted a more detailed analysis. The criteria used to identify appropriate culvert sites warranting mitigation measures were:

- Surrounding land development density should be rural or, in rare instances, suburban in the general vicinity of the structure.
- Surrounding land use should be open space, with other uses permissible if other site characteristics result in unique ecological value at the structure location.
- CAPS results should indicate an IEI value of 50 percent or higher for forests or freshwater wetland and aquatic landscapes on both sides of the railroad at the structure location, (culverts found between areas of high ecologic integrity (see Appendix 4.14-B); and
- Rivers, streams, ponds, wetlands, and uplands should have suitable habitat for fish and wildlife.

Based on these criteria, a decision tree (Figure 4.14-42) was developed to assist in determining mitigation recommendations for each culvert. As previously described, mitigation measures for the culverts would be:

- replace to meet the Standards;
- replace in kind;
- daylight; or
- subject to hydraulic analysis to determine if the structure is providing hydrologic control, (i.e., maintaining ambient hydrology in a functioning wetland, the alteration of which could cause unintended adverse consequences to the wetland), resulting in a range of recommended outcomes.

Criteria for additional tunnel and between-tie crossings (discussed in more detail below) include:

- Known ranges for rare species (e.g., Blanding's turtle, blue-spotted salamander, Eastern box turtle)

- Migration routes for rare species
- Presence or absence of culverts or bridges in the vicinity of migration routes
- Presence of vernal pools

Proposed Mitigation Measures

Bridges—The Stoughton Alternative includes only one new bridge (replacing a washed-out culvert) and one new trestle (above several existing culverts); there will be no new river or stream crossings. The new bridge, trestle, and all replacement bridges will use existing or replacement abutments at or near current abutment locations. The bridges over rivers, perennial streams, and abandoned farm roads will be replaced as previously described (see Table 4.14-18). Most of the bridges over rivers and streams will be designed to meet Standards, in particular including shelves on the waterfront banks to allow for wildlife passage (Figure 4.14-42). This will be accomplished in part by constructing new abutments behind existing abutments, and then partially or fully removing the existing abutments. In some cases, the existing abutments will not be replaced, or will be replaced at the same location, to preserve historic structures or meet spatial constraints. In these cases, the bridge would not incorporate wildlife crossing features. Bridges with several spans will be replaced with single or dual-span structures, reducing or eliminating impediments to fish passage in the river or stream.

Constructing the bridges over rivers or streams will take into consideration the DMF's recommendations for time-of-year restrictions for diadromous fish to the extent practical or use construction techniques (e.g., containment structures) that do not affect fish passage or use of spawning riffles (see Section 4.14.3.2).

A few of the bridges considered in this biodiversity assessment are in upland locations, and do not span rivers or streams. As previously noted, some of these structures accommodate flood flow, particularly near the Taunton River in Fall River, where Land Subject to Coastal Storm Flowage is mapped. These upland bridges may provide open passage to non-aquatic species, principally mammals and reptiles, but are generally in locations with low biodiversity. For these reasons, in-kind replacement is recommended.

An 8,500-foot long trestle will be constructed over a portion of the Hockomock Swamp, above the abandoned railroad bed. The trestle would be elevated three to four feet above the existing railroad berm to provide for large animal passage underneath. As noted below, existing culverts within this segment of the railroad will be "daylighted" (top section removed) to enhance their ecological value.

On the Whittenton Branch alignment piers or pilings supporting the existing Mill River Bridge would be replaced by a single pier at the center of a two-span structure, minimizing impacts to stream hydrology and fish habitat. Existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center of the span. New cast-in-place concrete abutments would be constructed behind the existing abutments, which would then be partially removed to an elevation equal to the river's average seasonal high water elevation to improve wildlife passage

Culverts—Mitigation recommendations for each culvert along the Stoughton Alternative are summarized in Table 4.14-35 and described below.

Table 4.14-35 Recommendations for Culverts

	Meet Standards	Hydraulic Analysis	Daylight	Replace in Kind	Eliminate
Stoughton Line	20	3	6	20	1
New Bedford Main	10	6	0	12	0
Fall River Secondary	3	5	0	18	1
Total	33	14	6	50	2

As shown in the decision tree (Figure 4.14-42), of the 105 culverts 77 connect areas of high biodiversity while 28 do not. The functional analysis of the 77 culverts determined that 53 of these culverts did provide a water-body related service while 24 do not. For the 53 culverts that provide a water-body related function connecting areas of high biodiversity, each was evaluated to determine if the culvert provides hydrologic control of an upstream wetland. Thirty-three of these culverts were determined to not provide hydrologic control; these culverts would be replaced to the Standards to the extent practicable (that is, taking into consideration the engineering constraints described above). The 33 culverts recommended for replacement to the Standards would meet the General standards, in particular the 1.2 times bankfull width, open bottom, and 0.82 openness ratio requirements. None of the culverts would be replaced with bridges to meet Optimum standards (e.g., spans) because the expense of that level of upgrade is not warranted. Table 4.14-36 lists the 33 culverts that would be replaced to meet the General Standards, facilitating fish and wildlife passage through culverts that convey perennial streams and wildlife passage (including aquatic species) through all other culverts.

A typical culvert cross-section meeting the Standards is depicted in Figure 4.14-43. The actual specifications for each structure will be determined on a location-specific basis during preliminary design, meeting the General standards and taking into consideration the engineering constraints as appropriate. As an example, a 40-foot long culvert would have a 32 square foot opening, likely 8 feet wide and 4 feet high.

A preliminary engineering review of the 33 culverts recommended to meet the Standards, based on these example specifications, determined that 20 of those culverts did not have sufficient cover to accommodate a 4-foot high structure. Raising the track bed to meet this cover requirement is not practicable due to the elevation change constraints of a high-speed commuter railroad. Actual specifications for each culvert will be determined during final design; the 0.82 openness ratio will be incorporated if feasible. Smaller openness ratios may be necessary to accommodate the cover requirements. The river and stream crossing standards for bridges and culverts, as described above, include provisions if it is not possible to meet all of the applicable Standards. Replacement of any of these structures will take into consideration other specifications of the General standards to the extent practical.

Table 4.14-36 Culverts Recommended to Meet General Massachusetts River and Stream Crossing Standards[81]

Culvert	Figure Number	Existing Structure Description	Hydrologic Function
CV-ST 6.45	4.14-11b	4'X2.5' stone box culvert, 75' long	Intermittent stream conveyance
CV-ST 6.69	4.14-11b	3'X3' stone box culvert, 70' long	Wetland equalizer
CV-ST 6.83	4.14-11b	3.5 X5' stone box culvert, 30' long	Intermittent stream conveyance
CV-ST 7.06	4.14-11b	2.5'X2' stone box culvert, 40' long	Intermittent stream conveyance
CV-ST 7.21	4.14-11b	2.7'X2' stone box culvert, 50' long	Intermittent stream conveyance
CV-ST 7.23	4.14-11b	2'X2.8' stone box culvert, 55' long	Intermittent stream conveyance
CV-ST 9.35	4.14-11c	2'X2' stone box culvert, 50' long	Wetland equalizer
CV-ST 9.65	4.14-11c	2'X2' stone box culvert, 50' long	Intermittent stream conveyance
CV-ST 10.05	4.14-11c	2'X2' stone box culvert, 40' long	Wetland equalizer
CV-ST 10.90	4.14-11c	12" CMP culvert, 50' long	Wetland equalizer
CV-ST 10.95	4.14-11c	5'X5' stone box culvert, 40' long	Perennial stream conveyance
CV-ST 11.11	4.14-11c	18" CIP culvert, 30' long	Wetland equalizer
CV-ST 11.59	4.14-11c	3'X3' stone box culvert, 50' long	Wetland equalizer
CV-ST 11.61	4.14-11c	36" CMP culvert, 50' long	Wetland equalizer
CV-ST 11.65	4.14-11c	12" CMP culvert, 40' long	Wetland equalizer
CV-ST 11.91	4.14-11c	5'X9' stone/rail box culvert, 25' long	Intermittent stream conveyance
CV-ST 13.83	4.14-11d	6'X6' stone box culvert, 50' long	Wetland equalizer
CV-ST 14.02	4.14-11d	3.5'X4' stone box culvert, 30' long	Wetland equalizer
CV-ST 16.00	4.14-11d	4'X4' stone box culvert, 25' long	Wetland equalizer
CV-ST 16.73[1]	4.14-11d	3'X3' stone box culvert, unknown length	Perennial stream conveyance
No number[1]	4.14-11e	2.5'X2' stone box culvert, unknown length	Wetland equalizer
CV-NB 14.52	4.14-12a	3.5'X3.5' stone box/36" CMP culvert, unknown length	Perennial stream conveyance
CV-NB 16.89	4.14-12a	1.5'X2' stone box/12" CIP culvert, 40' long	Wetland equalizer
CV-NB 17.89	4.14-12a	36" CMP culvert, 25' long	Perennial stream conveyance
No number	4.14-12b	Unknown	Wetland equalizer
CV-NB 20.37	4.14-12b	2'X3' stone box culvert, 45' long	Wetland equalizer
CV-NB 20.89	4.14-12b	2.5'X4' stone box culvert, 42' long	Wetland equalizer
CV-NB 21.51	4.14-12b	Two 3'X3' stone box culverts, unknown length	Wetland equalizer
CV-NB 21.68	4.14-12b	4'X3' concrete and stone box culvert, 35' long	Intermittent stream conveyance
No number	4.14-12b	7'X7' stone box culvert, 30' long	Intermittent stream conveyance
CV-FR 0.58	4.14-13a	8" CMP culvert, 20' long	Upland drainage
CV-FR 2.71	4.14-13a	18" CMP/2.5'X1.5' stone box culvert, unknown length	Intermittent stream conveyance
CV-FR 5.79	4.14-13b	3'X5' stone box culvert, unknown length	Wetland equalizer

1 Culvert not associated with Whittenton Alternative

[81] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012

Of the remaining 20 culverts that have a water-body related function and appear to provide hydrologic control of a wetland, hydraulic analysis is recommended for 14. If the culvert is not providing hydrologic control, it would be replaced to the Standards as described for the 33 culverts above. If the culvert is providing hydrologic control, it should either not be replaced (if replacement is not necessary for engineering reasons) or be replaced without altering the local hydrology (if replacement is necessary for engineering reasons). This could be accomplished by installing a weir on the upstream side of the culvert, albeit fish passage (if any) could be compromised by such an approach.

The last six culverts within this group lie within the segment of the Stoughton Line that would be traversed by the new trestle; these culverts would be daylighted. These particular structures will be beneath the trestle within the abandoned railroad bed. These culverts would function more effectively for reptile and amphibian passage across the railroad bed if they have open tops. Removing the layer of railroad ballast above the existing culverts and the top member of the stone or stone/rail box culverts is recommended for these structures.

Two of the 28 culverts that do not connect areas of high biodiversity could be eliminated because they do not appear to have any hydrologic or ecologic value. These two culverts (an un-numbered culvert in Easton immediately south of Foundry Street [Figure 4.14-11c] and CV-FR 8.97 in Fall River [Figure 4.14-13b]) are currently entirely plugged.

The remaining 26 culverts in that do not connect areas of high biodiversity, combined with the 24 culverts that do not have a water-body related function, result in 50 culverts that may be replaced in kind according to engineering requirements of the South Coast Rail project.

Tunnels and Between-Tie Crossings—Tunnels and between-tie crossings would be sited within known habitat for turtles and salamanders at upland locations where there are no existing culverts or bridges, such as within the Hockomock Swamp, Pine Swamp, Assonet Cedar Swamp, and Acushnet Cedar Swamp. An adequate number and density of crossings would be placed at vernal pool complexes and near grade crossings to allow turtles that wander onto the railroad or get stuck between the tracks to escape. Potential locations for these structures are depicted in Figures 4.14-11a through 4.14-13c and listed in Table 4.14-37. However, the actual type of wildlife crossing would be determined during final design, based on topography. The between-tie crossings would be designed in accordance with the Handbook recommendations described above; a typical structure is depicted in Figure 4.14-44.

Mitigation recommendations for each culvert along the Whittenton Alternative are summarized in Table 4.14-38. For culverts that appear to have some hydraulic control over wetland areas (i.e., are wetland equalizers), mitigation would begin with a hydraulic analysis to determine whether culverts should be replaced in kind (with no change to hydraulic function) or replaced according to the Massachusetts River and Stream Crossing Standards to the extent practicable (which could alter the hydrology of some areas). Daylighting of culverts to facilitate animal passage could be performed on culverts that connect areas of wildlife habitat.

Tunnels and between-tie crossings are likely to have little effect on areas of the Whittenton Branch north of Warren Street since the eastern side of the tracks contains little undeveloped land. South of Warren Street, in the vicinity of Wetlands TWB 05 through TWB 01, both the western and eastern sides of the tracks have large areas of undeveloped land that could benefit from daylighted culverts or other crossing measures.

Table 4.14-37 Proposed Tunnel and Between-Tie Crossing Locations

Crossing Type	Location	Connects	Figure Number
Type To Be Determined	Stoughton Line: South of North Easton Station site, Easton	CVPs and PVPs	4.14-11b
(2) Between-Tie	Stoughton Line: Easton Country Club Golf Course, Easton	Blanding's turtle habitat	4.14-11c
Tunnel	Stoughton Line: North of Foundry Street, Easton	Blanding's turtle habitat	4.14-11c
(3) Type To Be Determined	Stoughton Line: North of Bridge Street, Raynham	High-integrity forest on east and west sides	4.14-11d
Tunnel[1]	Stoughton Line: Pine Swamp, Raynham	High-integrity swamp on east and west sides	4.14-11d
Between-Tie	Stoughton Line: North of Raynham/ Taunton municipal boundary, Raynham	PVPs	4.14-11e
Between-Tie	Stoughton Line: South of Raynham/ Taunton municipal boundary, Taunton	PVPs	4.14-11e
Tunnel	New Bedford Main Line: South of Taunton Depot Station site, Taunton	PVPs	4.14-11e
Between-Tie	New Bedford Main Line: South of Malbone Street, Lakeville	High-integrity forest on east side and swamp on west side	4.14-12a
Type To Be Determined	New Bedford Main Line: North of Lakeville/ Freetown municipal boundary	High ecological integrity forest on east and west sides	4.14-12b
Between-Tie	New Bedford Main Line: North of Braley Road	Eastern box turtle habitat; high ecological integrity forest on west side	4.14-12c
Between-Tie	Fall River Secondary: South of Elm Street	High ecological integrity forest and PVP on east side; pond on west side	4.14-13a

1 Measure not associated with Whittenton Alternative

Table 4.14-38 Recommendations for Culverts–Whittenton Alternative

	Meet Standards	Hydraulic Analysis	Daylight	Replace in Kind	Eliminate
Stoughton Line – Canton, Stoughton and Easton	16	2	6	18	1
Whittenton Alternative – Raynham and Taunton	4	7	0	0	0
New Bedford Main	10	6	0	12	0
Fall River Secondary	3	5	0	18	1
Total	33	17	6	48	2

While there are no complexes of vernal pools along the Whittenton Branch, animals may still cross over the right-of-way moving to and from individual pools, wetlands, or upland areas.

In addition to replacement of the culverts in this section to facilitate wildlife passage, up to two additional culverts have been proposed in the DEIS/DEIR in this section of the Whittenton Branch to maintain wildlife habitat that exists on both sides of the tracks.

This section of the right-of-way is also in eastern box turtle habitat and would facilitate the crossing of turtles under the tracks, since constructing the tracks would create a barrier to movement across the currently inactive right-of-way.

Much of the area on both sides of the tracks in this section has been identified as wetlands; however, there is a stretch of approximately 200 feet between Wetlands TWB 04 and TWB 02 on the eastern side of the tracks, and Wetlands TWB-03.1 and TWB 01 on the western side of the tracks that are uplands. This area would be the preferred location for additional wildlife passage or passages under the right-of-way.

Design of culverts and other crossing measures would be as described in the Biodiversity Technical Report for the Stoughton Alternative. Treatments of culverts and bridges along the remainder of the Whittenton Alternative (from Canton to Raynham Junction and south of Weir Junction) would be the same as for the Stoughton Alternative.

Timing and Methods of Construction—Timing of construction may affect the extent of impacts to fish and wildlife species. Disturbance of habitat during the breeding season is likely to have greater short-term or individual effects on reproductive success, though short-term effects are not likely to have long-term repercussions unless the species population is already unstable. To avoid potential short-term effects to breeding wildlife, all efforts will be taken to avoid construction during the breeding season (April through June) in Hockomock and Pine Swamps. In all cases construction would be limited to normal daylight hours.

Construction impacts to aquatic resources will be mitigated by the appropriate use of erosion and sedimentation controls to minimize and eliminate sedimentation of wetlands and waterways. Erosion and sedimentation controls would be installed before construction begins, properly maintained, and removed after disturbed areas have stabilized.

4.15 THREATENED AND ENDANGERED SPECIES

4.15.1 **Introduction**

This chapter describes existing conditions, regulatory jurisdiction and evaluates impacts (both direct and indirect) of the alternatives on state and federally listed rare species.

4.15.1.1 Resource Definition

State-listed (rare) species are protected under the Massachusetts Endangered Species Act (MESA) of 1990,[1] and are classified as Endangered, Threatened, or Species of Special Concern. An "Endangered" species is one that is in danger of extinction throughout all or a significant portion of its range within Massachusetts. A "Threatened" species is one that is likely to become endangered in Massachusetts in the foreseeable future. Species of Special Concern are those species that biological research has documented to have suffered a decline that could threaten the species if the decline continues unchecked, or those species that occur in such small numbers or with such a restricted distribution that they could easily become threatened within the Commonwealth.

The Federal Endangered Species Act (ESA) of 1973[2] defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range." The ESA also defines a threatened species as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The ESA[3] protects species that are listed as endangered or threatened on a national basis.

4.15.1.2 Regulatory Context

Federal and state laws protect rare plants and animals and their critical habitats. The following describes the federal and state regulations that protect rare species and, in some instances, their habitats.

Federal Endangered Species Act

The ESA of 1973, (16 USC 1531 *et seq.,* as amended),[4] authorizes the determination and listing of species as Endangered and Threatened and prohibits unauthorized taking, possession, sale, and transport of endangered species. Section 7 of the Act[5] requires federal agencies to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or to modify their critical habitat. The U.S. Fish and Wildlife Service (USFWS) administers the Act. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries), a division of the U.S. Department of Commerce, is the lead federal agency responsible for the stewardship of the nation's offshore living marine resources and their habitat. NOAA Fisheries manages, conserves, and protects fish, whales, dolphins, sea turtles and other living creatures in the ocean, and administers the Endangered Species Act for species within its purview.

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[1] Massachusetts Endangered Species Act of 1990 (321 CMR 10.00: M.G.L. c. 131A.), Natural Heritage Endangered Species Program.
[2] Endangered Species Act of 1973, (16 U.S.C. 1531 et seq., as amended) United States Fish and Wildlife Service.
[3] Endangered Species Act of 1973, (16 U.S.C. 1531 et seq., as amended) United States Fish and Wildlife Service.

[4] Endangered Species Act of 1973, Section 7(16 USC 1531 et seq., as amended), United States Fish and Wildlife Service.
[5] Ibid.

Massachusetts Endangered Species Act

Massachusetts enacted MESA in 1990. The Act (M.G.L. Chapter 131A) and its regulations (321 CMR 10.00) prohibit the "taking" of any state-listed rare plants and animals unless specifically permitted for scientific, educational, or propagation purposes, or where a Conservation Permit is issued. "Take" includes protection of rare species habitat, and is defined as, "*in references to animals to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat*."

The regulations (321 CMR 10.05) state that "All State Agencies shall review, evaluate, and determine the impact on Endangered, Threatened and Special Concern species or their habitats… and use all practicable means and measures to avoid or minimize damage to such species or their habitats." State agencies are responsible for demonstrating to the Secretary that all practicable means and measures to protect rare species and their habitats have been incorporated into the project design. The Massachusetts Department of Fish and Wildlife's (DFW) Natural Heritage and Endangered Species Program (NHESP) is the agency responsible for ensuring compliance with MESA. A proposed project that would result in a "take," requires a Conservation and Management Permit from the NHESP.

State-listed (rare) species are protected under the MESA of 1990,[6] and are classified as Endangered, Threatened, or Species of Special Concern. An "Endangered" species is one that is in danger of extinction throughout all or a significant portion of its range within Massachusetts. A "Threatened" species is one that is likely to become endangered in Massachusetts in the foreseeable future. Species of Special Concern are those species that biological research has documented to have suffered a decline that could threaten the species if the decline continues unchecked, or those species that occur in such small numbers or with such a restricted distribution that they could easily become threatened within the Commonwealth.

Massachusetts Wetlands Protection Act

The Massachusetts Wetlands Protection Act Regulations (WPA [310 CMR 10.00 et seq.]) state that proposed projects that alter estimated rare wildlife habitat shall not be permitted to have any short-term or long-term adverse effects on the habitat of the local population of that species. The regulations only apply to proposed projects that would alter the habitat of a rare animal species occurring in a wetland resource area for which an occurrence has been entered into the official NHESP database. Rare plants are not regulated under the WPA. The NHESP maintains an atlas of Estimated Habitat for state-listed rare species, which was last updated in 2008.

4.15.1.3 Regulatory Coordination

On December 4, 2008, a letter was submitted by the applicant to the NHESP requesting site-specific rare species information. The list of species was provided by NHESP on January 8, 2009.[7] On December 4, 2008 a letter was submitted to the NMFS requesting information on any threatened and endangered fisheries resources located within the project area. NMFS response was received on January 12, 2009 with the determination that there are no federally endangered fisheries resources within the study area.

[6] Massachusetts Endangered Species Act of 1990 (321 CMR 10.00: M.G.L. c. 131A.), Natural Heritage Endangered Species Program.
[7] NHESP letter dated January 8, 2009.

Subsequent to the publication of the DEIS, the New York Bight Distinct Population Segment of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) was listed as an endangered species under the ESA by the NMFS on April 6, 2012.[8] However, the NMFS stated in its May 13, 2013 response letter it is unlikely that any species listed under their jurisdiction will be exposed to any direct or indirect effects of the proposed South Coast Rail project, including the Atlantic sturgeon. The above correspondence is included in Appendix 4.15-A.

The Certificate of the Secretary of Environmental Affairs on the ENF dated April 3, 2009,[9] also requested the applicant to consult with NHESP to discuss additional endangered species habitat assessments and surveys required in order to adequately quantify relative impacts of the alternatives. MassDOT has consulted with the NHESP subsequent to the DEIS/DEIR concerning the methodology for evaluating existing conditions and species impacts to state-listed threatened and endangered species.

The South Coast Rail project would result in a “take” of state-listed animals if the reconstruction of the rail system would directly harm state-listed animals, or if the project would disrupt breeding or migratory activity through the loss of habitat or loss of migratory pathways. The reconstruction of the rail system would result in a “take” of plant species where the project would result in the loss of habitat occupied by these species

The NHESP has determined that constructing the South Coast Rail project could have an adverse effect (a “take”) on three state-listed species: Blanding’s turtle (*Emydoidea blandingii*), eastern box turtle (*Terrapene carolina carolina*), and blue-spotted salamander (*Ambystoma laterale*). NHESP has determined, based on the preliminary design, that reconstruction of the track in the Southern Triangle would not constitute a “take” under MESA.

4.15.2 **Existing Conditions**

4.15.2.1 Regional Overview of Existing Conditions

This chapter includes a general description of the study area for threatened and endangered species and lists the rare species found within the polygons of Estimated and Priority Habitats that intersect or are adjacent to it.

Study Area

The study area for the assessment of threatened and endangered species is the portion of the South Coast region that is adjacent to or crossed by the Stoughton and/or Whittenton Alternatives south of Canton Junction. Within the study area, the alignment of each alternative intersects areas that contain wetlands and ecosystems that have been mapped as Priority and/or Estimated Habitat for rare species. Maps of the alternatives were examined for areas of mapped habitat that were intersected by or adjacent to a 100-foot buffer, measured from the centerline of the proposed railroad tracks of the Build Alternatives. Areas of important biodiversity value include the Hockomock Swamp, Pine Swamp, Assonet Cedar Swamp, Acushnet Cedar Swamp, and Forge Pond (Figure 4.15-1 through 4.15-2). In some cases, these ecosystems are within ACECs such as the Hockomock Swamp ACEC, (Figure 4.14-2). ACECs are described in Chapter 4.10, *Protected Public Open Space and Areas of Critical Environmental Concern*.

[8] Federal Register: February 6, 2012 (Volume 77, Number 24, page 5880-5912), Endangered and Threatened Wildlife and Plants; Threatened and Endangered Status for Distinct Population Segments of Atlantic Sturgeon in the Northeast Region.

[9] Executive Office of Transportation and Public Works, South Coast Rail Environmental Notification Form, November 2008.

Rare species represent one of the most sensitive elements of biodiversity. Other elements of biodiversity are addressed in Chapter 4.14, *Biodiversity, Wildlife, and Vegetation.*

The Stoughton and Whittenton Alternatives would utilize the Northeast Corridor between Canton Junction and South Station in Boston. However, the Northeast Corridor was not included in the study area because no construction/habitat disturbance would be required along the Northeast Corridor. Northeast Corridor is already electrified, thus catenary construction would not be needed in this area under the electric variants of the Stoughton and Whittenton Alternatives. In addition, there is no potential for indirect effects (noise disturbance, water quality impacts) on habitat along the Northeast Corridor because the South Coast Rail project trains would be a small incremental change relative to the heavy existing Northeast Corridor passenger and freight train traffic.

Priority and Estimated Habitats

A review of the 2008 Edition of the Massachusetts NHESP Natural Heritage Atlas was performed to identify areas where the South Coast Rail alternatives cross Priority Habitats of Rare Wildlife and Estimated Habitats of Rare Species. Priority Habitat is based on the known geographical extent of habitat for all state-listed rare species, both plants and animals, and pertains to MESA. Maps are used for determining whether or not a proposed project must be reviewed by the NHESP for MESA compliance.[10] Estimated Habitats are a sub-set of the Priority Habitats that are based on the geographical extent of habitat of state-listed rare wetlands wildlife. Each mapped Priority and Estimated Habitat is assigned a unique identification number that the Natural Heritage Program uses to track information related to each Priority Habitat and Estimated Habitat polygon.

Table 4.15-1 lists the Priority and Estimated Habitat polygon identification numbers that intersect or are adjacent to the project corridors. Table 4.15-2 lists the state-listed species that may be found within and/or adjacent to the South Coast Rail alternatives. This list is based on information provided by the NHESP on January 8, 2009,[11] in response to a formal request for a detailed list of species found within these Estimated and Priority Habitats (Figures 4.15-3). The above correspondence is included in Appendix 4.15-A.

The NHESP letter listed two Priority Habitat polygons (PH924/EH753 and PH926/EH755) that provide habitat for the state and federally endangered roseate tern (*Sterna dougalli*) and the state-special concern common tern (*Sterna hirundo*). These species and their Priority Habitat were excluded from both tables because these polygons are not adjacent to the 100-foot buffer of the project corridor and are separated from the New Bedford Main Line by major developed areas (Figure 4.15-8).

[10] Natural Heritage and Endangered Species Program Information: Priority Habitat and Estimated Habitat for Rare Species. Available online at: (http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm).

[11] NHESP letter dated January 8, 2009.

Table 4.15-1 Priority and Estimated Habitats Within or Adjacent to the Study Area

Project Alternative (segments)	Priority Habitat (PH) (Identification #)	Estimated Habitat (EH) (Identification #)	Location
Southern Triangle (New Bedford Main Line) (see Figures 4.15-4-8)	1093	951	Assonet Cedar Swamp, Mass Audubon Great Cedar Swamp, Assonet River, Cedar Swamp River, Cotley River
Southern Triangle (New Bedford Main Line) (see Figure 4.15-4-8)	1158	372	Apponquet Regional High School, Cedar Swamp River
Southern Triangle (New Bedford Main Line) (see Figures 4.15-4-8)	1349	1	Acushnet Cedar Swamp
Southern Triangle (Fall River Secondary) (see Figure 4.15-9-11)	1093	951	Assonet River
Stoughton Alternative (Stoughton Line) (see Figures 4.15-12-15)	1392	59	Hockomock Swamp ACEC, Hockomock Swamp WMA
Stoughton Alternative (Stoughton Line) (see Figure 4.15-12-15)	1297	1077	Pine Swamp
Whittenton Alternative (Whittenton Branch) (see Figure 4.15-16-17)	261	153	Tributary to Mill River

Table 4.15-2 Potential State-Listed Species Documented Within PH and EH Polygons Adjacent to the Project Alternatives

Species	Status[1]	Priority (PH) and Estimated (EH) Habitat[2]
Amphibians		
Blue-Spotted Salamander (*Ambystoma laterale*)	SC	PH1392/EH59
Reptiles		
Blanding's Turtle (*Emydoidea blandingii*)	T	PH1392/EH59;
Eastern Box Turtle (*Terrapene carolina carolina*)	SC	PH1392/EH59; PH1349/EH1; PH261/EH153
Crustacean		
Coastal Swamp Amphipod (*Synurella chamberlaini*)	SC	PH1349/EH1
Dragonflies		
Mocha Emerald (*Somatochlora linearis*)	SC	PH1093/EH951
Butterflies and Moths		
Hessel's Hairstreak *(Callophrys hesseli)*	SC	PH1349/EH1
Pale Green Pinion Moth (*Lithophane viridipalle*)	SC	PH1349/EH1
Water-Willow Stem Borer Moth (*Papaipema sulphurata*)	T	
Plants		
Gypsywort (*Lycopus rubellus*)	E	PH1392
Long-Leaved Panic-Grass (*Panicum rigidulum ssp. pubescens*)	T	PH1158

E = State Endangered, T =State Threatened, SC = State Special Concern. Fed E = Federal Endangered
Priority and Estimated Habitats (PH1158/EH372) have data sensitive species that were not released by NHESP.

Other State-Listed Species

The list of state-listed species (Table 4.15-2) provided by the NHESP includes only those species likely to be found adjacent to the alignment corridors of the alternatives. Other species may occur in the larger polygons, or within the contiguous ACECs, that are not listed in this table. Habitat for these additional

species may occur in areas adjacent to the alignment corridors. Based on information on the Massachusetts Department of Conservation and Recreation (DCR) ACEC Program website and the NHESP's lists of rare species by town, these could include freshwater mussels (tidewater mucket [*Leptodea ochracea*], triangle floater [*Alasmidonta undulata*], and eastern pondmussel [*Ligumia nasuta*]); damselflies (New England bluet [*Enallagma laterale*]); birds (American bittern [*Botaurus lentiginosus]*); amphibians (eastern spadefoot [*Scaphiopus holbrookii*]); and plants (Eaton's beggar-ticks [*Bidens eatonii*]; Long's bitter cress [*Cardamine longii*], cat-tail sedge [*Carex typhina*], round-fruited false-loosestrife [*Ludwigia sphaerocarpa*], climbing fern [*Lygodium palmatum*]*,* Philadelphia panic-grass [*Panicum philadelphicum*], pale green orchids [*Platanthera flava* var*. herbiola*], and grass-leaved ladies tresses [S*piranthes vernalis*]).

4.15.2.2 Rare Species Description and Habitat Requirements

This section includes a description of the range, habitat requirements, and areas where rare species are found within the polygons of Estimated and Priority Habitats that intersect or are adjacent to the study area. It also includes a summary of their breeding and nesting behavior. Unless otherwise indicated, the information below is based on the NHESP fact sheets for each species (www.mass.gov/dfwele/nhesp/species-info/nhfacts), accessed April 13, 2012.

Blue-Spotted Salamander (*Ambystoma laterale;* State Special Concern)

The NHESP database indicates that this species is present within the Hockomock Swamp polygon (PH1392/EH59). Populations of pure blue-spotted salamanders occur north of the hybridization zone with Jefferson salamanders (*A. jeffersonianum*). The area of populations of pure blue-spotted salamanders and hybrids extends from the Canadian Maritime Provinces, south along the Atlantic coast to northern New Jersey. The range extends westward through to northern Indiana and northeastern Illinois, through most of Wisconsin, eastern Minnesota and the southern half of Ontario. In Massachusetts, they occur predominantly within Middlesex and Essex Counties and in the adjacent eastern towns of Worcester County. Some occurrences are also noted within Bristol and Plymouth Counties. In general, Jefferson-blue-spotted complex salamanders found east of the Connecticut River are more likely to be blue-spotted salamanders. There are 102 towns in Massachusetts where blue-spotted salamanders have been observed. Over 172 occurrences have been documented since 1981, as well as 27 historic occurrences that were documented prior to 1981.

Blue-spotted salamanders require moist, moderately shaded environments; they favor northern hardwood/hemlock forests in glaciated areas with depressions available for seasonal flooding. Vernal pools, or temporary ponds, are necessary for reproduction and need to be full of dead and decaying leaves for cover and have overhanging bushes or grass for egg deposition. Roadside drainage ditches, small kettle holes, and temporary pasture ponds also provide habitat when flooded in the spring. Adults reside most of the year beneath leaf litter or underground to a depth of one meter, usually within 500 meters of their breeding pond. The brief breeding season lasts from mid-March to late April. Eggs are often laid singly or in a small egg mass, which cling lightly to overhanging vegetation or fall to the bottom of the pond.

Intensive rare species surveys conducted in 2001 identified a large population of blue-spotted salamanders in Hockomock Swamp, primarily south of Foundry Street, and confirmed that blue-spotted salamanders breed in vernal pools adjacent to the railroad berm in this area. A single blue-spotted salamander was trapped in the area immediately north of Foundry Street. The habitat of blue-spotted salamander was found to extend from approximately 650 feet north of Foundry Street to approximately

3,500 feet south of the power line. The adjacent forested uplands and wetlands provide suitable non-breeding habitat for this species.

Wood Turtle (*Clemmys insculpta*; State Special Concern)

The NHESP recently determined that habitat of the wood turtle occurs near the Southern Triangle. Due to its location in relation to the proposed railway alignment an analysis of impacts to this state-listed species was not included in this section.

Ringed Boghaunter (*Williamsonia lintneri*; State Threatened)

The NHESP has recently determined that habitat of ringed boghaunter dragonfly occurs near the Southern Triangle. However, due to its location in relation to the proposed railway alignment an analysis of impacts to this state-listed species was not included in this section.

Blanding's Turtle (*Emydoidea blandingii*; State Threatened)

The NHESP database indicates that this species is present within the polygons that include the Hockomock Swamp (PH1392/EH59). Blanding's turtles are found primarily in the Great Lakes region, extending to Kansas. Several smaller, disjunct populations occur in the East: in southern Nova Scotia, in an arc from eastern Massachusetts through southeastern New Hampshire to southern Maine, and in the New York's lower Hudson Valley. These populations (except those in New Hampshire) are all listed as threatened or endangered at the state or provincial level.

In Massachusetts, Blanding's turtles use a variety of wetland and terrestrial habitats. Blanding's turtles have been observed in seasonal pools, marshes, scrub-shrub wetlands, and open uplands.[12] Habitat use appears to vary according to the individual and the amount of precipitation, with more upland use during dry years.[13] Wetlands are used for overwintering during their inactive season (November to March).

Courtship and mating takes place during the spring and early summer and typically occurs in water. Females will remain in wetland or vernal pool habitat until they begin nesting. The majority of nesting occurs in June in open areas with well-drained loamy or sandy soils, such as dirt roads, powerline corridors, residential lawns, gravel pits, and early successional fields.

Field studies undertaken in 2009 confirmed Blanding's turtle use of the power line right-of-way east of Route 138. Habitat potentially used by this species along the Stoughton Alternative, as reported by NHESP, extends from Purchase Street in Easton to the Hockomock Swamp south of the power line right-of-way.

Eastern Box Turtle (*Terrapene carolina Carolina*; State Special Concern)

The NHESP database indicates that this species is present within the polygons that include the Assonet Cedar Swamp (PH1093/EH951), Acushnet Cedar Swamp (PH1349/EH1), wetlands and along the Whittenton Branch corridor (PH261/EH153). The Eastern box turtle's range is from southeastern Maine to northern Florida to Michigan, Illinois, and Tennessee. They occur throughout Massachusetts, but are more heavily concentrated in the southeastern section of the state.

[12] Sievert, P.R., Compton B.W., and M. Grgurovic. 2003. Blanding's Turtle (*Emydoidea blandingii*) conservation plan for Massachusetts. Pages 161. Report for Natural Heritage and Endangered Species Program. Westborough, MA.

[13] Joyal, L.A., McCollough, M. and J.M.L. Hunter. 2000. Population structure and reproductive ecology of Blanding's Turtle (Emydoidea blandingii) in Maine, near the Northeastern edge of its range. Chelonian Conservation and Biology 3:580-588.

In Massachusetts, Eastern box turtles inhabit many types of terrestrial habitats: both dry and moist woodlands, brushy fields, thickets, marsh edges, bogs, swales, fens, stream banks, and well-drained bottomland. Mating is opportunistic and may take place anytime between April and October. Females nest in June or early July and can travel great distances to find appropriate nesting habitat. Field studies in 2001 confirmed the presence of eastern box turtles in the Hockomock Swamp, south of the former Raynham Greyhound Park.

Coastal Swamp Amphipod (*Synurella chamberlaini*; State Special Concern)

The NHESP database indicates that this species is present within the Acushnet Cedar Swamp polygon (PH1349/EH1). In Massachusetts, the coastal swamp amphipod is known to be present in Dartmouth and New Bedford. Elsewhere in New England, records exist in southeastern Maine, Rhode Island, and eastern Connecticut. Its range also extends south from Maryland to South Carolina along the Middle Atlantic Coastal Plain.

In Massachusetts, coastal swamp amphipod is found in heavily vegetated, low-gradient, coastal wetland outlet streams of red maple and white cedar swamps in the Buzzards Bay moraine deposits.[14] This species can also be found in emergent marshes adjacent to these outlet streams. Elsewhere, the coastal swamp amphipod is known to inhabit small streams, bogs, ponds, and ditches.[15]

This species has an annual life cycle. In winter and spring, reproductive females brood up to 65 eggs per clutch.[16] In general, amphipods aggregate in large numbers and remain hidden in organic debris or among beds of aquatic vegetation.

Mocha Emerald (*Somatochlora linearis*; State Special Concern)

The NHESP database indicates that this dragonfly is present within the Assonet Cedar Swamp polygon (PH1093/EH951). The mocha emerald is distributed throughout the eastern United States from Massachusetts south to Florida and west to Michigan, Iowa, and Texas. In New England, the mocha emerald is recorded from Connecticut and Rhode Island, north only to Massachusetts. The species is known to inhabit about nine locations, all confined to eastern Massachusetts.

In Massachusetts, the mocha emerald has been found most often away from breeding habitats in fields and forest clearings. However, many of these areas are adjacent to habitats that, based on observations elsewhere in this species range, are appropriate breeding sites for the mocha emerald. Breeding sites for this species are small to medium-sized streams that flow through woods or swamps. A sand or gravel bottom may be an important habitat characteristic, since females prefer to oviposit (place their eggs) in this type of substrate. In addition to Assonet Cedar Swamp, Pierce Brook and the Cedar Swamp River (Assonet River) may provide suitable habitat for this species.

The mocha emerald has been recorded in Massachusetts from early July through mid-August. Information from nearby areas for this species extends the flight season from late June through early September. As in other regions where this species occurs, breeding in Massachusetts probably occurs from early July through August.

[14] Smith, D.G. 1987. The genus Synurella in New England (*Amphipoda, Crangonyctidae*). Crustaceana 53 (3): 304-306.

[15] Holsinger, J.R. 1972. The freshwater amphipod crustaceans (Gammaridae) of North America. United States Environmental Protection Agency. Biota of Freshwater Ecosystems. Identification Manual 5: 1-89.

[16] Holsinger, J.R. 1972. The freshwater amphipod crustaceans (Gammaridae) of North America. United States Environmental Protection Agency. Biota of Freshwater Ecosystems. Identification Manual 5: 1-89.

Hessel's Hairstreak (*Callophrys hesseli*; State Special Concern)

The NHESP database indicates that this butterfly is present within the Assonet Cedar Swamp polygon (PH1093/EH951) as well as the Pine Swamp polygon (PH129/EH1077). Hessel's hairstreak is distributed in scattered colonies along the Atlantic coastal plain from southern Maine to the Florida panhandle and southeastern Alabama. The greatest density of colonies is found in southern New Jersey, southeastern Massachusetts, and Rhode Island. In Massachusetts, most colonies are concentrated in southern Worcester, Norfolk, Bristol, and Plymouth Counties.

Hessel's hairstreak exclusively inhabits Atlantic white cedar swamps and bogs. This hairstreak has also been recorded in the Hockomock Swamp. Adults feed on nectar from swamp milkweed (*Asclepias incarnata*), shadbush (*Amelanchier alnifolia*), sand myrtle (*Leiophyllum buxifolium*), sweet pepperbush *(Clethra alnifolia)*, highbush blueberry *(Vaccinium corymbosum)*, buttonbush (C*ephalanthus occidentalis*), and dogbane (*Apocynum androsaemifolium*). It occurs only in or adjacent to Atlantic white cedar swamps and associated barrens. Males perch at the tops of white cedars in spring to seek receptive females, and females lay single eggs on the terminal shoots of white cedars. Larvae feed and develop into the pupal stage on the leaves of the host trees. Potential habitat along the project corridor for Hessel's hairstreak includes Atlantic white cedars established on the sideslopes of the embankment within Assonet Cedar Swamp, Pine Swamp, and Hockomock Swamp, and the extensive areas of Atlantic white cedar swamp within these wetlands.

Pale Green Pinion Moth (*Lithophane viridipallens*; State Special Concern)

The NHESP database indicates that this species is present within the Acushnet Cedar Swamp polygon (PH1349/EH1). The pale green pinion moth is spottily distributed along the coastal plain from southern New England south to New Jersey, with a more continuous range along the coastal plain from southern New Jersey south to Florida and west to Texas. In Massachusetts, this species occurs on the coastal plain in the southeast part of the state. In Massachusetts, the pale green pinion moth inhabits acidic, shrubby wetlands on the coastal plain, including wooded swamps, shrub swamps, shrubby bogs, and on the shores of coastal plain ponds. Suitable habitat occurs along the rail line through the Acushnet Cedar Swamp.

Adult moths emerge in October and early November and overwinter, flying on warm nights in late winter and early spring. Eggs are laid in spring on the larval host plants, which have not been documented in Massachusetts, but probably include a variety of acidic wetland shrubs such as holly (*Ilex* spp.), chokeberry (*Aronia* spp.), sweet pepper-bush, swamp-fetterbush (*Leucothoe racemosa*), maleberry (*Lyonia ligustrina*), and highbush blueberry.

Water-Willow Stem Borer (*Papaipema cataphracta*; State Threatened)

The NHESP database indicates that this moth is present within the Acushnet Cedar Swamp polygon (PH1349/EH1). The water-willow stem borer is endemic to southeastern Massachusetts, occurring in Plymouth and Bristol Counties as well as on Cape Cod and the offshore islands.

The water-willow stem borer inhabits shallow portions of coastal plain wetlands, in the shallowest portions of vernal pools, seasonally flooded swamps, abandoned cranberry bogs, and along upland edges of streams and ponds, where its obligate host water-willow *(Decodon verticillatus)* occurs. No specific surveys have been undertaken for Decodon, but it is likely that suitable habitat occurs near the rail line through Acushnet Cedar Swamp.

The water-willow stem borer is a nocturnal moth (noctuid) with a wingspan of 1.3 to 1.5 inches. Females lay eggs in late fall at the base of water-willow clumps, and when larva emerge the following spring, they bore into a water-willow stem, where they spend the summer. The larva pupate inside the stem in early fall, and upon emergence, look for a mate, reproduce, and die.

Gypsywort (*Lycopus europaeus*; State Endangered)

The NHESP database indicates that this plant is present within the Hockomock Swamp polygon (PH1392). Gypsywort is distributed from eastern Massachusetts southward to Florida and eastern Texas on the Coastal Plain, and northwards through the Mississippi River basin to southern Michigan. It is only sporadically found in the area between the Mississippi and the Atlantic Coast. Gypsywort is a coastal plain pond species occurring in smaller ponds with mucky to peaty soils, and is often associated with Plymouth gentian *(Sabatia kennedyana)*. Historically, it also was known from borders of ponds in Fall River and Westport.

Plant surveys conducted in 2001 identified a small population of gypsywort in open wetlands associated with Black Brook in the Hockomock Swamp, south of the power line right-of-way, within 15 feet of the existing railroad berm.[17]

Long-Leaved Panic-Grass (*Panicum rigidulum ssp. pubescens*; State Threatened)

This species is known to occur within the polygon that includes a wooded swamp area and the Cedar Swamp River (PH1158). The long-leaved panic-grass is associated with coastal plain pond shore communities.[18] No suitable habitat for this species has been identified in proximity to the rail right-of-way.

4.15.2.3 Rare Species Studies

This section describes specific rare species studies conducted in 2001 and 2008 along the Stoughton Line. These studies were undertaken to determine rare species occurrence along areas of this alternative where there is currently no track because NHESP determined that these were areas of concern.

In support of the 2002 Fall River/New Bedford Commuter Rail Extension EIR, a study was conducted in the spring and summer of 2001 to determine rare species occurrences in the Hockomock and Pine Swamps. The study methodology was developed in consultation with, and approved by, the NHESP and conducted under a Scientific Collecting Permit issued by the DFW. The rare species study area was defined as the area within 600 feet of the right-of-way centerline, extending from a point approximately 1,500 feet north of Foundry Street in Easton to Bridge Street in Raynham (Hockomock Swamp), and from King Philip Street to East Brittania Street in Raynham (Pine Swamp). This study area was divided into five segments, generally separated by roads or other features and with distinct vegetation types. Markers, consisting of numbered yellow plastic flagging and “tuft” stakes, were installed at 100-foot intervals to enable the study team to precisely locate rare species. The survey methods used included visual observation during “big night” events, drift fencing and pit traps, turtle hoop traps, radiotelemetry of turtles, invertebrate surveys, and rare plant surveys. Turtles equipped with radio transmitters were tracked daily until June 30, 2001 and then tracked weekly until September 30, 2001.

[17] New Bedford/Fall River Commuter Rail Extension Rare Species Study – Final Report. Prepared by VHB for MBTA, January 31 2002.
[18] Grass Manual on the Web, Utah State University. http://herbarium.usu.edu/webmanual, accessed April 13, 2012.

The 2001 study also included surveys for state-listed plant species and potential state-listed invertebrate habitats, based on host plant distributions.

In the spring of 2008, a survey using hoop traps, visual nesting surveys, and radiotelemetry was also conducted in Easton to locate Blanding's turtles. The following is a summary of the survey results for the blue-spotted salamander, eastern box turtle, and Blanding's turtle. No additional site-specific studies for state-listed species were undertaken at the direction of NHESP as existing information on species distributions was deemed adequate to evaluate impacts and develop a Conservation Management Plan (CMP).

Blue-Spotted Salamander (*Ambystoma laterale*)

The rare species study conducted in the spring and summer of 2001 documented a substantial population of blue-spotted salamanders that crossed the right-of-way in both directions. Blue-spotted salamanders were captured in 31 of the drift fence arrays, including 85 percent (11) of the drift fence arrays in a segment north of the powerline and 76 percent (16) of the drift fence arrays in a segment south of the powerline. No blue-spotted salamanders were found in Pine Swamp or in the Hockomock ACEC, south of the former Greyhound Park. One was captured north of Foundry Street.

Animals were captured in approximately equal numbers on both sides of the right-of-way. There did not appear to be any significant directional component to the population movement.

During the "big night" event (April 6, 2001), blue-spotted salamanders were observed in almost equal numbers north and south of the powerlines (27 and 31, respectively). The majority of animals to which a movement direction could be determined were moving across the right-of-way from west to east.

A total of 549 blue-spotted salamanders from a large population were captured in pit traps. An additional 58 animals were observed during visual night surveys. The majority of these animals were captured during the first two weeks of the study, with elevated numbers also observed in mid-May (Table 4.15-3).

Table 4.15-3 Blue-Spotted Salamander (*Ambystoma laterale*) Capture–by Date (2001)

Date	Total Number
March 31-31	64
April 1-15	293
April 16-30	41
May 1-15	8
May 16-31	134
June 1-15	9
June 16-30	0

Eastern Box Turtle (*Terrapene carolina carolina*)

One eastern box turtle was captured in 2001 and fitted with a radio transmitter. This turtle (designated B1) was captured in the upland forest west of the right-of-way, north of Bridge Street in Raynham. Turtle B1 was captured initially on May 11, 2001. It was tracked in the uplands west and north of the initial capture location until May 21, then relocated four weeks later (June 20) in the same area. The turtle was apparently west of the right-of-way, out of receiver range, during this period.

On June 30, 2001, the turtle research team documented the locations of turtle nests within the study area that had been excavated by predators. It was not possible to accurately determine the species of turtle; therefore, these data indicate the locations where all turtle species (spotted, snapping, and painted) nest within the study area. Turtle nests were found in six locations within the Hockomock Swamp. Generally, nests were found in the softer substrate at the edges of the right-of-way. More specific locations of turtle nests have been submitted to the NHESP.

The 2001 rare species study determined that eastern box turtles are infrequently found within the Hockomock Swamp ACEC, and that this species was found to occur only within upland forested areas south of the former Greyhound Park. The 2008 Blanding's turtle study conducted in the Hockomock Swamp (south of Foundry Street) found no eastern box turtles during the nest surveys.

Blanding's Turtle (*Emydoidea blandingii*)

The extensive studies conducted in 2001 found no evidence of Blanding's turtles in the surveyed areas. However, NHESP records show several individuals north and east of the right-of-way in Easton.

In June 2008, habitat evaluations and surveys along the Stoughton Alternative were conducted for the state-Threatened Blanding's turtle. This survey was performed because the NHESP database indicated the presence of Blanding's turtles in the vicinity of the existing railroad bed. Surveys and habitat evaluations were conducted along an approximately 1.3-mile section of an existing railroad bed and a 1.2-mile section of an existing powerline easement within the Hockomock Swamp in Easton. The area surveyed extends from approximately 0.16 mile north of Foundry Street to 1.14 miles south of Foundry Street along the railroad bed. The purpose of this study was to verify the presence of Blanding's turtles, evaluate their use of aquatic habitats and upland nesting habitats, and to start establishing a subpopulation of Blanding's turtles outfitted with radio transmitters.

The Blanding's turtle study area is almost entirely within land managed by the DFW's Hockomock Swamp Wildlife Management Area. Wetland and upland areas adjacent to the proposed project are mapped by the NHESP (2008) as Priority Habitat (PH1392) and Estimated Habitat (EH59) for the Blanding's turtle. Mapped habitat areas extend from the northern extent of the study area (southern boundary of the Easton Country Club), south approximately 3.7 miles to I-495 and from Prospect Street and Howard Street west of the railroad bed to beyond Route 24 east of the railroad bed.

The survey methodology included:

- Trapping in specially designed sardine-baited hoop traps, (3- and 4-foot diameter, 1-inch mesh)
- Repeated transect and/or meander surveys of suitable habitat on foot
- Basking surveys from shore with binoculars
- Meander surveys through suitable nesting habitats

One female Blanding's turtle (designated EB-1) was observed east of Route 138 and outfitted with a radio transmitter. One nest was found approximately 2 meters from the location where EB-1 was observed. Other recent observations documented by NHESP have been east of the rail corridor as well.

Deep aquatic habitats typically associated with this species were limited within the survey area and were primarily associated with Black Brook and a few isolated pockets within the greater Hockomock Swamp area. Areas of suitable foraging habitat (e.g., vernal pools), large expanses of unfragmented open space for migration, and suitable nesting habitats were observed during the nesting surveys. Potential Blanding's turtle habitats were also investigated from a broader landscape perspective; this investigation was primarily based on interpretation of 2005 MassGIS color aerial photographs with field verification of some areas.

A variety of landscape features are present within the vicinity of the railroad bed including commercial and residential development, paved roads, a school, a landfill, golf courses, cranberry bogs, a power line easement, and forested uplands. Wetland habitat types in the study area consist of a variety of deciduous and coniferous palustrine forested (PFO) wetland systems, scrub-shrub (PSS) and emergent (PEM) wetland systems, certified vernal pools, and a perennial, unconsolidated bottom riverine system (Black Brook). The majority of suitable aquatic habitat occurs east of the rail corridor, in the vicinity of the cranberry bog complex north of Foundry Street and in the Hockomock Brook and Hockomock Swamp east of Route 138. No suitable aquatic habitat occurs west of the rail corridor north of Foundry Street. NHESP has indicated that they believe that Blanding's turtles use habitats east and west of the rail corridor from the powerlines north through the golf course area.

In 2009 radio-telemetry was conducted in several site visits down to the Hockomock Swamp in Easton, MA with the primary goal of re-capturing the female Blanding's turtle that was outfitted with a transmitter in June 2008, and removing that transmitter. The female Blanding's turtle covered significant distances (approximately 3 miles over the 6 point observations collected between June 2008 and July 2009) and was hand captured on July 5, 2009 within 100 feet of her June 2008 nesting location. The survey was submitted to NHESP.

Rare Plant Survey

Rare plant species recorded for the Hockomock Swamp ACEC, according to NHESP, include:

- *Ludwigia sphaerocarpa* (coastal plain pondshores)
- *Lycopus rubellus* (coastal plain pondshores)
- *Scirpus longii* (coastal plain pondshores, fens)
- *Sabatia kennedyana* (coastal plain pondshores)
- *Utricularia biflora* (coastal plain pondshores)

The entire alignment within the Hockomock Swamp segment of the right-of-way (including all areas within 100 feet of the right-of-way) was investigated by a qualified plant taxonomist in 2000-2001 to determine if potential habitats for state-listed plant species occur within or adjacent to the corridor. Three wetland areas within 100 feet of the railroad right-of-way were investigated to determine if these provide coastal plain pondshore or fen habitats, and if any of these or other state-listed species were present. Detailed location information has been provided to the NHESP.

None of the wetlands adjacent to the right-of-way are coastal plain ponds or fens. The Black Brook wetland, located adjacent to the right-of-way and south of the powerline, contains a small population of

gypsywort, a state-listed plant. This species was found within 15 feet of the right-of-way. No other state-listed species were found in areas adjacent to the right-of-way.

Habitat of State-Listed Invertebrates

Areas along the Stoughton Line, particularly within the Hockomock Swamp and Pine Swamp, were surveyed in the spring and summer of 2000 and 2001 to determine if suitable habitat for state-listed invertebrates is present, based on the presence of host plant species. This survey found that suitable habitat (Atlantic white cedars (*Chamaecyparis thyoides*) and water-willow) for two state-listed insects is present.

Potential habitat along the project corridor for Hessel's hairstreak includes Atlantic white cedars that have become established on the sideslopes of the embankment within Hockomock Swamp and Pine Swamp as well as the extensive areas of Atlantic white cedar swamp within these wetlands.

Two areas of water-willow have been identified along the right-of-way in the Hockomock Swamp. The first is in the southern portion of the ponding area associated with Certified Vernal Pool 1711 (within Wetland EA37). The second is in a pond in Wetland EA37, west of the railroad embankment, approximately 900 feet north of the former Greyhound Park.

4.15.2.4 Existing Conditions within the Study Corridor

This section lists and describes the Priority and Estimated Habitats that are crossed by the alternatives and the state-listed species associated with each.

Southern Triangle (Common to All Rail Alternatives)

The Southern Triangle section of the project area includes the existing active Fall River Secondary and the New Bedford Main Line. Portions of these rail lines are within mapped Priority and Estimated Habitats. Based on the 2008 NHESP Atlas, the New Bedford Main Line crosses three NHESP Priority and Estimated Habitats (PH1093/EH951, PH1158/EH372, and PH1349/EH1), including the Cotley River, Cedar Swamp River, Assonet Cedar Swamp/Great Cedar Swamp, and the Acushnet Cedar Swamp (Figures 4.15-4-8).

The Fall River Secondary crosses one NHESP Priority and Estimated Habitat (PH1093/EH951). This section of the right-of-way includes several smaller wetlands along the Assonet River (Figures 4.15-9). Table 4.15-4 lists the species found within these Priority and Estimated Habitats. These sections include a description of the Priority Habitats polygons crossed by the New Bedford Main Line and Fall River Secondary and the suitable habitat for rare species within these areas. Because the Southern Triangle covers an extensive area and crosses several diverse habitats, existing conditions are described for individual segments along New Bedford Mainline and Fall River Secondary.

Table 4.15-4 Southern Triangle Priority and Estimated Habitats

Species	Priority Habitat (PH) (Identification #)	Estimated Habitat (EH) (Identification #)	Project Alternative (Areas of High Biodiversity)
Eastern Box Turtle (Terrapene carolina carolina) Mocha Emerald (Somatochlora linearis) Hessel's Hairstreak *(Callophrys hesseli)*	1093	951	New Bedford Main Line and Fall River Secondary (Assonet Cedar Swamp/Mass Audubon Great Cedar Swamp/Assonet River/Cedar Swamp River/ Cotley River)
Long-Leaved Panic-Grass (Panicum rigidulum ssp. pubescens) Data-sensitive species	1158	372	New Bedford Main Line (Apponquet Regional High School/Cedar Swamp River/ wooded swamp)
Eastern Box Turtle (Terrapene carolina carolina) Coastal Swamp Amphipod (*Synurella chamberlaini*) Pale Green Pinion Moth (*Lithophane viridipalle*) Water-Willow Stem Borer Moth (*Papaipema sulphurata*)	1349	1	New Bedford Main Line (Acushnet Cedar Swamp)

* Mapped habitat is within 100 feet of but does not intersect the right-of-way.

New Bedford Mainline

Assonet Cedar Swamp (PH 1093/EA 951) (New Bedford Main Line)—The polygon with Priority Habitat (PH1093) includes the Assonet Cedar Swamp which is located in Lakeville and is sometimes referred to as the Great Cedar Swamp. The Great Cedar Swamp borders the Cedar Swamp River and Assonet River south of Myricks Junction (Figure 4.15-5). The Assonet Cedar Swamp includes the Assonet Cedar Swamp Wildlife Sanctuary, a 1,000-acre parcel of conservation land in Lakeville owned by the Massachusetts Audubon Society (Figure 4.15-5). The existing New Bedford Main Line, currently used for freight rail service, crosses the Assonet Cedar Swamp for approximately 1 mile and forms its western boundary for approximately 1 mile in Lakeville. The extensive wetland contains one of the largest Atlantic white cedar swamps in the state.

This polygon extends for approximately 3.5 miles through Berkley and Lakeville. Because the polygon covers an extensive area and crosses several diverse habitats, existing conditions are described for individual segments within the polygon.

Northern Limit to Padelford Street—This section extends for 0.9 mile (Figure 4.15-4-5), and is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The railbed passes through forested uplands and two large wetlands associated with the Cotley River (BKCM 4, BKCM 11, BKCM 18). Portions of these wetlands are dominated by shrub swamp. The Cotley River passes under the railbed.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles.

Padelford Street to Myricks Street—This section extends for 0.65 mile (Figure 4.15-5), and is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The railbed primarily passes through a large wetland which is forested on the west side of the right-of-way (BKCM 14) and a shrub swamp on the east side (BKCM 20).

This segment is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road may be used for nesting although they do not provide optimal habitat due to the dense and stony substrate. The existing tracks are a barrier to the movement of eastern box turtles.

Myricks Street to Malbone Street—This section extends for 0.4 mile (Figure 4.15-5), and is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The railbed primarily passes through upland areas which are disturbed, and passes between two small forested wetlands (BK 1, BKN 1).

This segment is bordered by areas of marginally suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles.

Malbone Street to Southern Limit Assonet Cedar Swamp—This section extends for 1.7 miles (Figures 4.15-5), and is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The railbed is an elevated berm above wetlands for much of its length, passing through a complex of deciduous forested wetlands, Atlantic white cedar swamp, and more open shrub-dominated swamp. Two perennial streams (Pierce Brook and the Cedar Swamp River) cross under the railbed and may provide habitat for the mocha emerald (*Somatochlora*).

This segment is bordered by some areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. The adjacent wetlands also provide habitat for Hessel's hairstreak (in Atlantic white cedar trees) and the mocha emerald dragonfly may breed in adjacent streams.

Howland Road Area (PH 1158/EA 372)—This 0.5 mile polygon is an active freight railroad (Figure 4.15-5-6) located in Lakeville and Freetown. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The northern section is bordered primarily by forested upland, with a complex of smaller interconnected wetlands in the central portion (LK 12 to LK 19) includes open space areas such as the Apponquet Regional High School, wooded swamps, and other wetlands associated with the Cedar Swamp River. These are forested wetlands, although portions of LK 18 are mapped as Atlantic white cedar swamp (coniferous wetland). Several small culverts convey streams beneath the railbed.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. There are no open coastal plain pond or sandy wetland habitats adjacent to the railbed that provide suitable habitat for long-leaved panic-grass. Within the portion of the polygon (PH1158) crossed by the New Bedford Main Line, one data-sensitive species is also known to be present.[19]

[19] NHESP letter dated January 8, 2009.

Acushnet Cedar Swamp (PH 1349/EH 1)—The polygon with Priority Habitat (PH1349) includes the Acushnet Cedar Swamp State Reservation, which is an approximately 1,000-acre property located in New Bedford and Dartmouth, north of the New Bedford Airport (Figure4.15-7). This is one of eight cedar swamps in public ownership in Massachusetts, and has been designated by the U.S. Department of the Interior – National Park Service as a National Natural Landmark.[20] The existing New Bedford Main Line, currently used for freight rail service, forms the eastern boundary of the State Reservation for approximately 1.5 miles in New Bedford and crosses it for approximately 800 feet. It is an outstanding example of an Atlantic white cedar swamp and provides habitat for several state-listed species. Within the part of the Acushnet Cedar Swamp and adjacent areas crossed by the New Bedford Main Line, four state-listed species (eastern box turtle, coastal swamp amphipod, pale green pinion moth, and water-willow stem borer moth) are known to be present.[21]

This polygon extends for approximately 3 miles through Freetown and New Bedford. Because the polygon covers an extensive area and crosses several diverse habitats, existing conditions are described for individual segments within the polygon.

Northern Limit Acushnet Cedar Swamp to Chipaway Road—This 1,600-foot section (Figure 4.15-6) is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. It is bordered by two narrow forested wetlands (FRN-25, FRN 26) and upland forest.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. Ditches and wetlands adjacent to the right-of-way may provide suitable habitat for the coastal swamp amphipod. Adjacent wetlands may also provide suitable habitat for the pale pinon moth and the water-willow stem borer moth.

Chipaway Road to Samuel Barnett Boulevard—This 1.2 mile section (Figure 4.15-7) is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The land to the east, in the northern portion of this section, is a commercial cranberry bog operation consisting of managed bogs and a large pond. The remaining section is bordered by upland forest and forested wetlands containing one certified vernal pool.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. Ditches and wetlands adjacent to the right-of-way may provide suitable habitat for the coastal swamp amphipod. Adjacent wetlands may also provide suitable habitat for the pale pinon moth and the water-willow stem borer moth.

Samuel Barnett Boulevard to Route 140—This 1.5 mile section (Figure 4.15-7-8) is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The land west of the right-of-way is the Acushnet Cedar Swamp State Reservation, and is predominantly forested wetland (NB 22). This wetland is primarily deciduous or

[20] Sorrie, Bruce A. and Henry L. Woolsey, 1987. The Status and Distribution of Atlantic White Cedar in Massachusetts. In A. Laderman, Atlantic White Cedar Wetlands, Westview Press. Pp. 135-142.

[21] NHESP letter dated January 8, 2009.

mixed wetland, with some areas dominated by Atlantic white cedar swamp. Although there is a narrow wetland along the east side of the right-of-way (NB 20), industrial and residential development are close to the railroad right-of-way along this entire segment.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles (although it is unlikely that box turtles occur east of the right-of-way due to extensive development). Ditches and wetlands adjacent to the right-of-way may provide suitable habitat for the coastal swamp amphipod. Adjacent wetlands may also provide suitable habitat for the pale pinon moth and the water-willow stem borer moth.

A transfer power substation is proposed in this segment, immediately south of the powerline right-of-way that parallels Samuel Barnet Boulevard. This would result in the loss of 1.25 acres of potential eastern box turtle habitat.

Fall River Secondary

Within the part of the Assonet Cedar Swamp and adjacent areas crossed by the New Bedford Main Line and Fall River Secondary, three state-listed species (eastern box turtle, mocha emerald, and Hessel's hairstreak) are known to be present.[22] The Fall River Secondary passes through this Priority Habitat (PH1093) from Myricks Junction to Beechwood Road (1.1 miles) (Figures 4.15-9-11). This active freight railroad was constructed as a single track. In the northern section, the railbed is bordered by disturbed uplands or lawns. The remaining section is bordered by forested uplands or forested wetlands (deciduous). The railroad crosses the Cedar Swamp River on a bridge. The Cedar Swamp River may provide suitable habitat for the mocha emerald. There are no Atlantic white cedar swamp habitats along this section.

One culvert in this segment that would be reconstructed to meet Commonwealth of Massachusetts Stream Crossing Standards,[23] and the Cedar Swamp River bridge would be reconstructed with wildlife shelves. None of the filled wetland provides suitable habitat for the mocha emerald. Improving culverts and bridges within this segment could have temporary construction-period impacts to mocha emerald habitat, but would result in an overall improvement by replacing culverts with open-bottom structures.

Potential Rare Species Habitat

This section summarizes the potential rare species habitat adjacent to the right-of-way. Both the New Bedford Main Line and Fall River Secondary are active freight lines with ballasted right-of-way, tracks and ties. There are culverts that convey streams underneath the embankment. The right-of-way itself does not provide suitable habitat for any of the rare species and the tracks and ties prevent turtles and amphibians from moving across the right-of-way, except through the culverts.

- Suitable forested upland habitat for the eastern box turtle is found boarding the New Bedford Main (Acushnet Cedar Swamp and Assonet Cedar Swamp).

[22] NHESP letter dated January 8, 2009.

[23] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

- Coastal swamp amphipods may find suitable habitat within slow-moving streams and inundated hollows in the forested swamps of Acushnet Cedar Swamp.

- Mocha emerald may find suitable habitat along streams that flow through woods or swamps of the Assonet Cedar Swamp.

- Pale green pinion moth may find suitable habitat within wooded swamps of the Acushnet Cedar Swamp.

- Water-willow stem borer moth is a globally restricted species, occurring only in southeastern Massachusetts along upland edges of streams and ponds where its obligate host, water-willow, occurs. It may find suitable habitat in seasonally flooded swamps and along edges of streams and ponds.

- Hessel's hairstreak may find suitable habitat in the Atlantic white cedars that have become established on the sideslopes of the embankment within the Assonet Cedar Swamp and the extensive areas of Atlantic white cedar swamp within these wetlands.

- Long-leaved panic-grass likely does not find suitable habitat within portions of the Priority Habitat (PH1158) adjacent to the New Bedford Main Line because there are no coastal plain ponds located adjacent to the railroad embankment. NHESP has recently determined that habitat of two additional species, wood turtle and ringed boghaunter dragonfly occurs near the Southern Triangle. Due to its location in relation to the proposed railway alignment an analysis of impacts to these two state-listed species was not included in this chapter.

Eastern box turtles may find some suitable habitat within the forested, shrub or meadow portions of the mapped Priority Habitats (PH261 and PH1439) associated with the Three Mile River.

Stoughton Alternative

The study area for the Stoughton Alternative, north of Weir Junction, includes improvements to existing active freight or rail lines (from north of Stoughton Station, and Dean Street to Cotley Junction) and track construction on out-of-service or abandoned rights-of-way (between Stoughton Station and Dean. This Alternative would include constructing a trestle through part of the Hockomock Swamp to reduce impacts to wetlands and rare species.

Based on the 2008 NHESP Atlas, the Stoughton Alternative crosses two Priority and Estimated Habitats (PH1392/EH59, and PH1297/EH1077). These Priority habitats include land within the Hockomock Swamp ACEC, and Pine Swamp (Figures 4.15-12-15).

Table 4.15-5 lists the species found adjacent to the Stoughton Alternative corridor within these Priority and Estimated Habitats, based on information provided by NHESP.

Table 4.15-5 Stoughton Alternative Study Area—Priority and Estimated Habitats

Species	Priority Habitat (PH) (Identification #)	Estimated Habitat (EH) (Identification #)	Project Alternative (Areas of High Biodiversity)
Blue-Spotted Salamander (*Ambystoma laterale*) Blanding's Turtle (*Emydoidea blandingii*) Eastern Box Turtle (*Terrapene carolina carolina*) Gypsywort (*Lycopus rubellus*)	1392[1]	59	Stoughton Alternative (Hockomock Swamp ACEC/Hockomock Swamp WMA)
Hessel's Hairstreak *(Callophrys hesseli)*	1297	1077	Stoughton Alternative (Pine Swamp)

1 Priority Habitat (PH1392) includes an additional 11 state-listed species which do not occur adjacent to the rail corridor.

These sections include a description of the Priority Habitat polygons crossed by the Stoughton Alternative and the suitable habitat for rare species within these areas.

Hockomock Swamp ACEC (PH1392)—This polygon extends for a total of 5.5 miles from Purchase Street in Easton to I-495 in Raynham. The polygon with Priority Habitat (PH1392) includes the Hockomock Swamp ACEC, which is approximately 16,950 acres of land in Bridgewater, Easton, Norton, Raynham, Taunton, and West Bridgewater (Figures 4.15-14-15). The ACEC is fragmented by several major transportation corridors, including Routes 24, I-495, 138, 106, and other major roadways, and it includes substantial upland areas within the watershed of the Hockomock Swamp. These uplands include land developed in commercial and residential uses as well as undeveloped forested upland and farmland.

The DCR describes the ACEC as one of the most extensive inland wildlife habitats in southeastern Massachusetts. The Atlantic white cedar swamp and acidic fen wetland communities scattered throughout the Hockomock Swamp ACEC are considered to be outstanding examples of these unique natural communities. The ACEC provides habitat for at least 13 species listed as rare, endangered, or of special concern by the NHESP, and much of the ACEC is designated as BioMap Core Habitat. Within the part of the ACEC crossed by the Stoughton Alternative, four state-listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, and gypsywort) are known to be present.[24] The majority of the vernal pools that support blue spotted salamanders are located between Foundry Street and the existing power line, near the South Easton Vocational and Technical School. The Atlantic white cedar stands also provide potential habitat for Hessel's hairstreak. Because the polygon covers an extensive area and crosses several diverse habitats, existing conditions are described for individual segments within the polygon. However, Atlantic white cedar trees are confined to the west side of the existing railroad grade, evidencing the probability that the original establishment of the right-of-way in ca. 1866 eventually altered the delicate hydrogeology of the previously contiguous Atlantic white cedar swamp.

Purchase Street to Prospect Street—The railroad right-of-way within this 0.75 mile section (Figure 4.15-14) consists of a narrow (6 feet wide) gravel pathway on the former railbed. There are drainage ditches on either side of the railbed that have become partially blocked. Due to these blockages, drainage has been diverted onto the railbed, which functions as an intermittent stream. Residences are immediately

[24] NHESP letter dated January 8, 2009.

adjacent to the railbed on the west side, for approximately 0.4 mile. The adjacent land is primarily forested, and includes forested uplands and wetlands.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. Eastern box turtles, if present, may move across the right-of-way to access suitable habitat areas on either side. NHESP also considers this segment to be within the potential habitat of Blanding's turtle.

Prospect Street to Foundry Street—The railroad right-of-way within this 0.9 mile section (Figure 4.15-14) consists of a 10-foot wide gravel pathway on the former railbed (with evidence of use by ATVs). For the northern 0.3 mile, the right-of-way is bordered by forested upland and wetland on the west, associated with Black Brook, and by a golf course on the east. For the next 0.3 mile, the right-of-way passes between two golf courses. The southern third passes between two large wetlands (EA 82, EA 81). A certified vernal pool is east of the right-of-way just north of Foundry Street. During the 2001 field study, a single blue-spotted salamander was trapped in this area.

This segment is bordered by areas of suitable upland habitat for eastern box turtle and wetlands potentially used by Blanding's turtle. Sandy soils in the golf courses may provide nesting habitat for either turtle species, which, if present, may move across the right-of-way to access suitable habitat areas on either side.

Foundry Street to Power Line—The railroad right-of-way within this 0.6 mile section (Figure 4.15-14) consists of a wide gravel pathway on the former railbed (with evidence of use by ATVs). The Southeast Regional Vocational Technical High School is east of the right-of-way at Foundry Street. The baseball field is immediately adjacent to the railbed. The right-of-way passes through a white pine forested upland and deciduous forested upland and wetlands (EA 77, EA 78) in the northern half and deciduous forested wetland (EA 63, EA 64) in the southern half. An open former sand/gravel pit is west of the railbed at Wetland EA 65.1. Several certified vernal pools are within this section, on both sides of the railbed. At the southern end of this section, the railbed crosses a right-of-way for an overhead power line and the powerline maintenance road. The railbed consists of an open, wide sandy road adjacent to wetlands dominated by woody shrubs, including of highbush blueberry, sweet pepperbush, swamp azalea, and common winterberry (*Ilex verticillata*). Typical herbaceous vegetation include skunk cabbage (*Symplocarpus feotidus)*, cinnamon fern (*Osmunda cinnamomea*), and sensitive fern (*Onoclea sensibilis*) and in some disturbed areas giant reed grass (*Phragmites australis*).

This segment is bordered by areas of suitable upland habitat for eastern box turtle, wetlands potentially used by Blanding's turtle, and vernal pools used as breeding habitat by blue-spotted salamanders. Sandy soils in the gravel pit, or in the ballfield, may provide nesting habitat for either turtle species. All three species may move across the right-of-way to access suitable habitat areas on either side. Significant use of the ACEC by ATVs is evident along the right-of-way, within the abandoned gravel pit, and within side trails, many of which pass in serpentine or circuitous pathways across and through the vernal pools, causing significant disturbance to the soils and likely concomitant damage to egg masses and larval and juvenile stages of amphibians, particularly blue spotted salamander, American toad (*Bufo americanus*) and wood frogs (*Rana sylvatica*). These uses are neither sanctioned nor actively prohibited by MassDOT or Department of Fish and Game personnel.

The northernmost 1,200 feet of this segment would be the approach to the trestle. In this approach segment, the track would slope up, and retaining walls would be used to minimize fill. A traction power substation would be constructed east of the right-of-way, within an area of white pine forest or in the

ballfield. The track would be on the trestle for majority of this section, and the only impacts would result from vegetation removal.

Power Line to Former Raynham Greyhound Park—The railroad right-of-way within this 1.7 mile section (Figures 4.15-14-15) consists of a wide gravel pathway on the elevated former railbed (with evidence of use by ATVs). The railbed passes through primarily forested red maple-dominated wetlands, although there is an open emergent marsh and shrub swamp west of the railbed (south of the powerline), a large vernal pool east of the railbed, (probably a former borrow pit from which earthen materials were once extracted to construct the grade), and an Atlantic white cedar swamp located entirely west of the railbed and extending for approximately 0.6 mile north of the former Raynham Greyhound Park. Three certified and two potential vernal pools occur within this section.

This segment is bordered by wetlands potentially used by Blanding's turtle, wetlands and uplands potentially used by eastern box turtles, and vernal pools used as breeding habitat by blue-spotted salamanders. Based on prior studies, the railroad embankment through the Hockomock Swamp provides limited nesting habitat due to the dense gravel substrate and shaded light regime. Although turtles are occasionally observed to nest on the embankment, the open sandy soils under the power line and along the power line roadway are preferred nesting sites based on field observations by the Corps and others of nesting turtles and predated nests. Sandy soils under the powerline may provide nesting habitat for either turtle species. All three species may move across the right-of-way to access suitable habitat areas on either side. Gypsywort occurs in the open emergent wetland west of the railbed, south of the power line. There would be no impact to this population.

Former Raynham Greyhound Park to Bridge Street—The railroad right-of-way within this 1.1 mile section (Figure 4.15-15) consists of a wide gravel roadway on the former railbed, with evidence of extensive use by ATVs. The northernmost 1,400 feet of this section is bordered to the east by an industrial park, with a detention basin that drains onto the right-of-way. This drainage, combined with a stream flowing from the west, has been identified as a perennial stream flowing north within the railbed. The railbed passes through primarily upland forest, and passes through one small wetland system (R 61, R 59). A maintained powerline is located on the east side of the railbed. A complex of potential vernal pools occurs on both sides of the railbed approximately 1,500 feet north of Bridge Street.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. Eastern box turtles, if present, may move across the right-of-way to access suitable habitat areas on either side.

Bridge Street to I-495—The railroad right-of-way within this 0.25 mile section consists of a wide gravel path on the former railbed. The railbed is bordered by a small park and ballfield to the east, and by residential development on both sides. Elm Street crosses the right-of-way mid-way between Bridge Street and the highway.

Pine Swamp (PH1298)—The polygon with Priority Habitat (PH1297) includes the Pine Swamp, a 275-acre wetland system in western Raynham that includes several properties owned by the Town of Raynham Conservation Commission (Figures 4.15-15). This area consists of forested and marsh wetlands and is located within mapped estimated habitat of several rare wetlands species. It supports an Atlantic

white cedar swamp community. Within the part of the Pine Swamp crossed by the Stoughton Line, one state-listed species (Hessel's hairstreak) is known to be present.[25]

The railroad right-of-way through Pine Swamp, between King Phillip Street and East Britannia Street (Figure 4.15-15), is on an elevated berm for the northern 0.5-mile section and at-grade in the southern section. The railbed contains a narrow (3 to 4 feet wide) path and a powerline owned by the Taunton Municipal Light Company. The northernmost 500 feet is bordered by residential development on the west side. An auto junkyard is east of the right-of-way at the East Britannia Street crossing. The railbed and adjacent powerline are predominantly vegetated with shrubs and herbaceous species, including giant reed grass. Adjacent areas are forested or shrub-dominated wetlands (including a large stand of giant reed grass). The forested wetland east of the railbed is dominated by deciduous trees, while the forested wetland west of the railbed is dominated by Atlantic white cedar.

Atlantic white cedar trees, present in the wetland west of the railbed and on the railbed itself, provide breeding habitat for Hessel’s hairstreak butterflies. Atlantic white cedars are present at low densities in Wetland RA12.2, west of the railbed, between the southern Pine Swamp Brook crossing and the northern Pine Swamp Brook crossing. The southernmost trees are located at wetland flag RA12.2-154 (STA 1729), and are approximately 6 feet west of the wetland flag. The northernmost trees are located at wetland flag RA12.2-138 (STA 1711). The Atlantic white cedar community spans a distance of approximately 1,800 linear feet. Trees are primarily growing on the west side of the perimeter ditch, 5 to 6 feet west of the wetland flags. There are occasional trees on the railbed side of the ditch. The Atlantic white cedars occur at low densities within a predominantly red maple (*Acer rubrum*) forested wetland, and co-occur with tupelo (*Nyssa sylvatica*), white pine (*Pinus strobus*), highbush blueberry, dangleberry (*Gaylussacia frondosa*), sweet pepperbush, and poison sumac (*Toxicodendron vernix*). A total of 35 trees were observed on, or within 10 feet of the railbed along this 1,800 foot distance.

Potential Rare Species Habitat

This section summarizes the potential rare species habitat adjacent to the right-of-way. The Stoughton Line is an inactive line without tracks and ties for most of its length. There are culverts that convey streams underneath the embankment. In addition to the culverts, the right-of-way itself provides suitable migratory habitat for rare species in locations where there are no tracks and ties to prevent turtles and amphibians from moving across the right-of-way. The right-of-way may provide suitable nesting, feeding, sheltering, or overwintering habitat for rare species where it has become overgrown. However, portions of the right-of-way show evidence of heavy although unauthorized use by all-terrain vehicles (ATVs), pedestrians and bicycles. Several existing vernal pools adjacent to or nearby the right-of-way also exhibit use by ATVs, with obvious pathways of tire-ruts leading from the railroad corridor into the adjacent habitats, and disturbed soil throughout. This has obvious negative consequences for habitat by crushing eggs or other sensitive life stages of rare species and/or their preferred prey. Nevertheless, successful migrations across the right-of-way by blue-spotted salamanders and certain other fauna are likely not jeopardized by these uses of the corridor, since such crossings generally occur at night and/or early spring when ATVs and other users of the track are likely to be less prevalent. More severe impacts from ATVs are likely within the vernal pools themselves.

As described in Section 4.15.2, a study was conducted in the spring and summer of 2001 to determine rare species occurrences in the Hockomock and Pine Swamps. The study documented a substantial population of blue-spotted salamanders that crossed the right-of-way in both directions. No blue-

[25] Ibid.

spotted salamanders were found in Pine Swamp or in the Hockomock ACEC south of the former Greyhound Park. The largest concentration (85 percent of all animals) was found between the powerline corridor and the Greyhound Park. The Stoughton Line provides migratory habitat for the blue-spotted salamanders.

Based on the Blanding's turtle survey conducted in 2008 within the Hockomock Swamp, Blanding's turtles may find suitable aquatic habitat primarily associated with Black Brook (where it crosses the right-of-way) as well as within vernal pools and other isolated pockets within the greater Hockomock Swamp area. The utility corridor that crosses the rail right-of-way provides suitable nesting habitat for the turtles. Nesting habitat provided within or adjacent to the rail right-of-way is of marginal quality in those areas where the canopy is open enough to allow sunlight to incubate the eggs for long enough periods of time for viable survival.

The eastern box turtle may find some suitable habitat within the forested portions of the right-of-way. However, due to its linear nature and lack of adjacent expanses of forested uplands, it is not ideal habitat for this species. Eastern box turtles are more likely to be found within the upland portions of the powerline corridor and the forested upland areas within the study area. During the 2001 rare species survey, one eastern box turtle was captured and fitted with a radio transmitter. This turtle (designated B1) was captured in the upland forest west of the right-of-way, north of Bridge Street in Raynham. The 2001 rare species study determined that eastern box turtles are infrequently found within the Hockomock Swamp ACEC, and that this species was found to occur only within upland forested areas south of the former Greyhound Park. The 2008 Blanding's turtle study conducted in the Hockomock Swamp (south of Foundry Street) found no eastern box turtles during the nest surveys.

The project corridor may provide marginal nesting habitat for eastern box turtles. However, these areas would be limited to portions of the right-of-way where the canopy is open enough to allow sunlight to incubate the eggs for long enough periods of time for viable survival. Turtles moving between patches of suitable habitat may also cross the right-of-way.

During the 2001 rare species studies, suitable habitat for Hessel's hairstreak was observed where Atlantic white cedars have become established on the sideslopes of the embankment within Hockomock Swamp and Pine Swamp as well as the extensive areas of Atlantic white cedar swamp within these wetlands. No Hessel's hairstreaks were observed during this study.

During the 2001 rare species study, suitable habitat for water-willow stem borer was observed within the Hockomock Swamp in two areas where water-willows were identified along the Stoughton Alternative. One small population of gypsywort was identified within 10 to 15 feet of the railroad berm south of the utility corridor. It is likely that additional areas of suitable habitat exist within the Hockomock Swamp.

Whittenton Alternative

The Whittenton Alternative runs predominantly along the same route as the Stoughton Alternative. The Whittenton Alternative is different from the Stoughton Alternative only along a portion of right-of-way between Raynham Junction and Weir Junction, a length of approximately 5.8 miles. A section of the Whittenton Alternative, known as the Whittenton Branch, diverges from the Stoughton Line at Raynham Junction and travels through Raynham and Taunton for approximately 3.4 miles to Whittenton Junction. This section of track is inactive. At Whittenton Junction, the track joins the Attleboro Secondary, an active rail line, for approximately 2.4 miles to Weir Junction at the beginning of the New Bedford Main

Line. The Whittenton and Stoughton Alternatives run the same route on the Stoughton Line from Canton to Raynham Junction. The New Bedford Main Line and the Fall River Secondary are also identical for both alternatives. Figure 4.15-16-17 shows the Whittenton Alternative.

Priority Habitat polygons (PH261 and PH1439) include portions of the recently-designated Three Mile River Watershed ACEC. This ACEC covers approximately 14,275 acres in Dighton, Norton, and Taunton (Figures 4.15-16-17). The ACEC is fragmented by Route 140, a major transportation corridor, and several other major roadways. It includes substantial upland areas that are developed with commercial and residential uses as well as undeveloped forested upland and farmland.

The ACEC provides habitat for several species listed by the NHESP as rare, endangered, or of special concern. Within the part of the ACEC crossed by Whittenton Alternative on the Attleboro Secondary, one state-listed species (eastern box turtle) is known to be present. The Three Mile Watershed contains many important habitats. A total of 13,486 acres (nearly 95 percent) of the ACEC are comprised of the habitats designated by the NHESP as BioMap Core Habitat and Supporting Natural Landscapes, and as Living Waters Core Habitat and Critical Supporting Watersheds. The certified vernal pools in the ACEC have been found to provide breeding habitat for wood frogs, spotted salamanders (*Ambystoma maculatum*), and fairy shrimp (*Eubranchipus* spp.). The inland wetlands provide food, cover, and shelter for waterfowl, muskrats (*Ondatra zibethica*), snakes, turtles, amphibians, and insects. The floodplain provides essential breeding habitat for reptile and amphibian species, including several NHESP listed species.

Potential Rare Species Habitat

A portion of the Whittenton Branch and a portion of the Attleboro Secondary are within an area listed by the NHESP as eastern box turtle habitat. This area extends from Warren Street on the Whittenton Branch to Whittenton Junction, and along the Attleboro Secondary to a point approximately 500 feet before Danforth Street. The right-of-way itself does not provide suitable habitat for any of the rare species, and the tracks and ties constrain the movement of turtles and amphibians across the right-of-way except through the culverts.

Impacts to rare species habitat are not expected along the Attleboro Secondary because it is an existing active rail line and already presents a barrier to wildlife movement.

Along the Whittenton Branch, while the existing access road does not constitute wildlife habitat, constructing the railroad would result in additional impacts on either side of this road. More substantial impacts would occur along the southernmost section of the right-of-way between the access road and Whittenton Junction, where the path is narrower. Area of impact was estimated by measuring the area inside the limit of work (limit of grading) and subtracting the area of the roadway and path, based on available survey information. A total of approximately 1.2 acres of rare species habitat (successional vegetation along the edge of the traveled path) would be permanently impacted from constructing the railroad. In addition, a total of approximately 0.6 additional acre of eastern box turtle habitat would be temporarily impacted, based on an estimated additional 4 feet outside the limit of grading on both sides of the right-of-way that would be necessary to construct the berm and grading for the railroad. All impacted habitat is upland area except for approximately 460 square feet of permanent impact and 820 square feet of temporary impact to Wetland RWB 04. Wildlife crossings are proposed to facilitate movement under the right-of-way, as described in the previous section

Stations

This section describes the Priority and Estimated Habitats within the proposed station sites associated for the Stoughton and Whittenton Alternatives.

None of the proposed station sites are within mapped Priority Habitat. All the proposed station sites are within partially or fully developed areas. Raynham Park is the only station where the platform would be within mapped Priority Habitat (PH1392); the rest of the Raynham Park station site and its parking lot would not be within the Priority Habitat polygon. This station would serve the Stoughton Alternative and is located at the former Greyhound Park in Raynham (Figure 4.15-15). The Raynham Park Station site is entirely developed and does not provide potential habitat. Based on the habitat requirements of the species known to occur in the study area, it is unlikely that any of the identified rare species would be found on any of the station sites, except for the Eastern Box Turtle, which is a habitat generalist.

Layover Facilities

Neither of the proposed overnight layover facilities (Wamsutta and Weaver's Cove East) are located within a Priority or Estimated Habitat polygon.

One midday rail layover facility is planned for the Boston area, This site is associated with the proposed expansion of South Station, which has independent utility of the South Coast Rail project and is not part of the South Coast Rail project. Any impacts associated with the expansion of South Station, including midday layover facilities, would be addressed through the environmental review process associated with the proposed expansion of South Station. The proposed expansion of South Station is discussed in Chapter 3 as part of the No-Build Alternative.

4.15.2.5 Summary of Existing Conditions

A total of 9 state-listed rare species, have been recorded in areas adjacent to the alternatives corridors. These include one salamander, two turtles, one crustacean, three moths and butterflies, one dragonfly, and one plant species.

The Southern Triangle, common to all Build Alternatives, includes two active freight lines with ballasted right-of-way, tracks and ties. The right-of-way does not provide suitable habitat for any of the rare species, and the tracks and ties prevent turtles and amphibians from moving across the right-of-way except through the culverts. Suitable foraging, breeding, and nesting habitat for rare species occurs adjacent to the rail rights-of-way, particularly in the Assonet Cedar Swamp and Acushnet Cedar Swamp.

The Stoughton Alternative is an inactive right-of-way corridor without tracks and ties from Easton (Short Street) to Longmeadow Street in Taunton . Along this corridor, the right-of-way itself may provide migratory habitat for rare species such as the blue-spotted salamander, Blanding's turtle, and eastern box turtle because there are no tracks and ties to prevent small animals from moving across the right-of-way. The right-of-way itself is unlikely to provide suitable nesting, breeding, or foraging habitat for rare species. Areas on and adjacent to the right-of-way provide habitat for state-listed plants and invertebrates.

The Whittenton Branch and a portion of the Attleboro Secondary are within an area listed by the NHESP as eastern box turtle habitat. The right-of-way itself does not provide suitable habitat for any of the rare species, and the tracks and ties constrain the movement of turtles and amphibians across the right-of-way except through the culverts.

None of the proposed station sites intersect mapped areas of Priority and Estimated Habitat. The only station site that is located adjacent to mapped areas of Priority Habitat is Raynham Park), which largely developed and does not contain significant habitat resources. Based on the habitat requirements of the species known to occur in the study area, it is unlikely that rare species would be found at the proposed station platform site. The eastern box turtle is a habitat generalist and could occur at undeveloped station sites such as the Taunton Depot Station sites, although none have been observed at that location. Table 4.15-6 provides a summary of existing conditions and compares the different alternatives.

Table 4.15-6 Summary of Project Alternatives near Suitable Rare Species Habitat

Alternative	Total # of PH and EH Intersected / Adjacent	Total # of Rare Species Recorded
Southern Triangle New Bedford Main Line	3	7
Fall River Secondary	3	7
Stoughton Alternative Stoughton Alignment	2	5
Whittenton Alternative Whittenton Alignment	3	5

4.15.3 **Analysis of Impacts and Mitigation**

4.15.3.1 Introduction

This section describes and evaluates impacts that the proposed South Coast Rail alternatives may have on threatened and endangered species within the project study area. Both direct and indirect effects are considered and discussed for each of the project elements. Measures incorporated in the alternatives' designs to avoid and minimize, and when necessary mitigate for unavoidable impacts are described for each of the project elements. Regulatory jurisdiction and compliance with state, and federal regulations are also discussed.

This section also addresses the requirements of the Certificate of the Secretary of Environmental Affairs on the ENF dated April 3, 2009,[26] as well as the Secretary's Certificate on the DEIS/DEIR (June 29, 2011[27]), which required the following.

- Include a detailed quantification and analysis of the relative impacts of the alternatives on state-listed species and their habitats; the analysis should include all components of the project alternatives, including the rail alignments (including the Southern Triangle), stations and layover facilities, and secondary growth impacts.
- Describe how potential impacts of the alternatives will be avoided and minimized.
- Include a detailed description of proposed mitigation measures for each alternative.

[26] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the DEIS/DEIR, South Coast Rail Project (EEA# 14346), April 3, 2009.

[27] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the DEIS/DEIR, South Coast Rail Project (EEA# 14346), June 29, 2011.

- Describe the endangered species permitting process for each alternative based on consultations with NHESP.
- Discuss how costs associated with permitting, including mitigation requirements, are incorporated in the alternatives analysis.
- Consult with NHESP about the methodology to be used prior to any additional habitat analysis and to discuss metrics to be used in the FEIR for assessing impacts to state-listed species and their habitat.
- Consult with NHESP regarding the assumptions related to vegetation cover that were used in the DEIS/DEIR. The analysis of impacts for the Stoughton route should be revised in the FEIR to reflect the full range of vegetation cover types that each state-listed species requires, as recommended by NHESP.
- Quantify impacts to state-listed species, vernal pool habitat, general wildlife, and state-owned open space, and a detailed plan for minimization and mitigation of impacts.
- Provide comprehensive description of how the applicant proposes to meet MESA regulatory requirements, including the standards for authorizing a take of a state-listed species through a Conservation and Management Permit.
- Provide detailed descriptions and discussion of rare species and wildlife crossings and barrier design (for example, culverts and bridges) as well as other minimization measures such as construction management to minimize turtle and salamander mortality.
- Explain in detail how the project will meet the long-term “net benefit” standard in 321 CMR 10.23 including detailed mitigation plans that should be developed in consultation with NHESP. These mitigation plans should be at a very specific level of detail to demonstrate clearly that appropriate and effective mitigation will be implemented.
- Evaluate any potential impacts to migration associated with widening the existing tracks and right-of-way.

Section 4.15.3.2 describes the methodology and definition of impact, Section 4.15.3.3 identifies individual elements impacts along each alternative, Section 4.15.3.4 identifies general temporary construction period impacts, Section 4.15.3.5 summarizes the impacts by alternative, Section 4.15.3.6 presents mitigation approaches, and Section 4.15.4 describes compliance with state and federal regulatory requirements.

4.15.3.2 Impact Assessment Methodology

The proposed South Coast Rail alternatives and associated stations are expected to have direct and indirect effects on rare species and their habitat. This section discusses direct and indirect effects in general, and describes the methodology used to calculate and evaluate impacts to rare species within the project study area.

The list of state-listed species found within Priority and Estimated Habitat polygons that intersect or are adjacent to the project corridors was provided by the NHESP on January, 8, 2009, in response to a

formal request for a detailed list of species found within these Estimated and Priority Habitats. This chapter also addresses the requirements of the Certificate of the Secretary of Environmental Affairs on the ENF and DEIR/DEIS dated April 3, 2009,[28] and June 29, 2011,[29] respectively.

Method for Assessing Direct Impacts

Temporary and permanent direct impacts to rare species and their habitat are anticipated along each of the Build Alternatives. Direct impacts include impacts from construction, grading, vegetation management, and mortality associated with potential collisions with rail traffic. These activities may result in degradation of ecological function and, loss of habitat, as well as loss of rare plant and animal species. Potential temporary construction related impacts are described in Section 4.15.3.4. Permanent effects may include losses or changes in habitat and rare plant and wildlife species through clearing, grading, construction, and the potential introduction of undesirable, invasive species.

Potential habitat loss is a direct effect of transportation projects. Habitat loss occurs if an area that previously provided food, cover, water, and/or breeding resources to a rare species is cleared, paved, filled or altered in such a way that it no longer provides one or more of these resources.

The majority of the work associated with the Build Alternatives falls within existing railroad rights-of-way, therefore, minor temporary and permanent impacts to rare species habitat may occur within narrow strips immediately adjacent to the right-of-way as necessary for track reconstruction and minor re-alignment of track in certain areas.

Direct impacts were calculated through the use of a Geographic Information Systems (GIS) model. This model quantified impacts by intersecting proposed work areas with NHESP Priority and Estimated Habitat polygons for rare species. The model quantified all loss of habitat along the project corridors and at the proposed station sites based on the limit of permanent alteration. Areas within permanent alteration limits that are already disturbed, such as ballasted railbed and roads, were not counted as habitat loss. In addition, impact areas less than 10 feet wide were not counted as habitat loss, because impacts in those areas are expected to be avoided as the final design is developed. Impacts to wetland habitats were calculated based on the updated wetland delineations conducted for the project (and reviewed by each Conservation Commission pursuant to an Order of Resource Area Delineation) and the updated track designs. Temporary wetland impacts during construction were calculated based on an average 4-foot construction offset from the toe of slope. The cover type data were produced based on field observations and review of aerial photographs and MassGIS mapping, as well as field studies undertaken in 2001 and 2009. Additional field observations were made in 2011 during field review of the Abbreviated Notices of Resource Area Delineation filed with each of the corridor conservation commissions, and supplemented by additional field investigations to map specific habitat types in 2012.

Method for Assessing Indirect Impacts

The CEQ defines indirect effects (or impacts) as effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems,

[28] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the DEIS/DEIR, South Coast Rail Project (EEA# 14346), April 3, 2009.

[29] The Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the DEIS/DEIR, South Coast Rail Project (EEA# 14346), June 29, 2011.

including ecosystems. Indirect effects change the quality or functions of a resource, are measured qualitatively and, therefore, are more difficult to accurately assess than direct effects. Indirect effects include habitat fragmentation and associated edge effects; the loss of genetic diversity of rare plant and animal populations, increased competition for resources, and physical or psychological restrictions on movements caused by some feature within a corridor that wildlife are unwilling or unable to cross. Indirect effects can be caused by the increased noise and visual disturbance from land-clearing, earth-moving, and construction machinery during construction. Following construction, noise associated with the active rail line may cause indirect effects if wildlife avoid habitat near the embankment.

Fragmentation is defined as the subdivision of once large and continuous tracts of habitat into smaller patches. It results from agriculture, urbanization, and transportation or other rights-of-way.[30] Fragmentation clearly has consequences on wildlife communities, especially on rare species. Habitat fragmentation is associated with edge effects when there is a disturbed or developed area created adjacent to a natural and/or forested area. Edge effects may include the spread of invasive species, increase in the canopy gap, and a decrease in species dependent on core and/or undisturbed habitat. In general, fragmentation of habitat is viewed as detrimental when considering original native, climax species composition and abundance, natural history, and relative ecological stability of unmanaged plant and animal populations.

A railroad corridor may act as a barrier that interferes with the movement of some mammals, amphibians, birds and reptiles from one habitat to another. The width of a railroad corridor can influence the frequency of wildlife crossings, as well as the mortality associated with potential collisions with rail traffic. The rail itself can create a barrier to smaller species such as amphibians, reptiles, and smaller mammals. Traffic density and traffic speed may also influence wildlife avoidance of transportation corridors.[31,32,33,34] The loss of migratory routes (barrier effect) was estimated by calculating the length of the new track through the polygons of Priority and Estimated Habitat. This is a conservative estimate of impact because it is unlikely that the entire length of the proposed new track would cross habitat suitable for migration.

For the purposes of calculating barrier effect impacts, it was assumed that impacts to migration would only occur on proposed new tracks. For the Stoughton Alternative and Whittenton Alternatives it would include new track construction on abandoned/out-of-service right-of-way segments of the former Stoughton Line and Whittenton Branch. Existing abandoned tracks such as those on portions of the abandoned Stoughton line provide a semi-porous access for wildlife due to missing cross-ties, missing lengths of rail, and other track degradation. Construction of new tracks in abandoned rail right-of-way would reduce the porosity typical of abandoned tracks and as such could impact migration. It was assumed that there would be no new impacts to migration in areas with existing active tracks.

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[30] Rosenfield, R.N., C.M. Morasky. J. Bielefeldt, and W.L. Loope. 1992. *Forest fragmentation and island biogeography: a summary and bibliography*. U.S. Department of the Interior Technical Report NPS/NRUW/NRTR 92/08.

[31] Reijnen, R., R. Foppen, C. ter Braak, and J. Thissen. 1995. *The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads*. Journal of Applied Ecology. 32: 187-202.

[32] Reijnen, R., R. Foppen, and H. Meeuwsen. 1996. T*he effects of traffic on the density of breeding birds in Dutch agricultural grasslands.* Biological Conservation. 75: 255-260.

[33] Reijnen, R. 1995. *Disturbance by car traffic as a threat to breeding birds in The Netherlands*. PhD thesis, DLO Institute of Forestry and Natural Resources. Wageningen, Netherlands.

[34] Formann, R.T.T. and L.E. Alexander. 1998. *Roads and their major ecological effects.* Annual Review of Ecological Systematics. 29:207-31.

Chapter 4.14, *Biodiversity*, *Wildlife, and Vegetation*, provides a broader analysis of the indirect impacts to natural habitats and communities. Chapter 5 evaluates potential indirect effects and cumulative impacts.

4.15.3.3 Impacts of Alternatives by Element

This section describes specific potential impacts that the proposed South Coast Rail alternatives, stations, layover facilities, and traction power stations (specific to the electric alternatives) may have on rare species. These alternatives include the No-Build Alternative (Enhanced Bus), Stoughton Alternative (Electric and Diesel), and Whittenton Alternative (Electric and Diesel) (Figure 4.15-4 through 4.15-17).

The majority of the Build Alternatives use existing segments of active freight and commuter rail lines with ballasted right-of-way, tracks, and ties. Existing culverts carry streams beneath the railroad embankment. These culverts maintain wetland hydrology and provide crossing points for migratory wildlife to access wetland areas on either side of the embankment. The right-of-way itself does not provide suitable habitat for any of the rare species and the tracks and ties prevent turtles and amphibians from moving across the right-of-way except through the culverts. Only the out-of-service portions of the Stoughton Line (Stoughton Alternative) where tracks and ties have been removed (generally, south of Prospect Street in Easton) and Whittenton Branch (Whittenton Alternative) provide suitable unrestricted migratory habitat for rare species.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would consist of enhancing current bus service along existing roads and highways. The following three existing park-and-ride facilities would be modified as part of the No-Build Alternative:

- The West Bridgewater Park-and-Ride, located near the southwest corner of the intersection of Routes 106 and 24
- The Mount Pleasant Street Park-and-Ride, located on the northwest corner of the intersection of King's Highway and Route 140 in New Bedford
- The Silver City Galleria Park-and-Ride, located adjacent to the Silver City Galleria shopping mall in Taunton

None of the proposed park-and-ride facilities are within Estimated and Priority Habitats. Therefore, none of the components of the No-Build Alternative are expected to impact rare species and/or their habitat.

Southern Triangle (Common to All Rail Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all Build Alternatives. These rail lines form a roughly triangular shape running south from Weir Junction through Myricks Junction to New Bedford along the New Bedford Main Line, and from Myricks Junction to Fall River along the Fall River Secondary, and are therefore referred to as the Southern Triangle. The following sections describe the potential impacts to rare species that may result from new construction for these two components of the Build Alternatives. The southern part of the South Coast Rail study area is encompassed by the other Build Alternative described in subsequent sections.

New Bedford Main Line Rail Segment

The New Bedford Main Line rail segment would require upgrading and reconstructing the existing freight rail tracks (Figures 4.15-4-8). Two new train stations would be constructed in New Bedford (King's Highway and Whale's Tooth) and one in Taunton (Taunton Depot). Double-track sections would be constructed around King's Highway Station, and a combination of double and triple-track would be constructed from Weir Junction to Myricks Junction. Under the electrification alternatives, four traction power stations would be built along this track segment. Impacts to rare species potentially resulting from developing the new stations and layover facilities are discussed later in this section.

Based on the 2008 NHESP Atlas, the New Bedford Main Line crosses three NHESP Priority and Estimated Habitats (PH1093/EH951, PH1158/EH372, and PH1349/EH1). These habitats include the Cotley River, Cedar Swamp River, Assonet Cedar Swamp/Great Cedar Swamp, and the Acushnet Cedar Swamp (Figures 4.15-8). No ACECs are crossed by the New Bedford Main Line. Both direct and indirect impacts as they relate to this rail segment are described below.

Direct Impacts of the Rail Build Alternatives: New Bedford Main Line Rail Segment

The New Bedford Main Line is an active railroad, and the majority of the improvements would occur within the footprint of the existing track. Analysis by NHESP confirms that improvements to the New Bedford Main Line would result in relatively minor impacts to state-listed species. Minor temporary and permanent impacts may occur within narrow strips immediately adjacent to the right-of-way as necessary for track reconstruction and minor re-alignment of track segments in certain areas. The only major change would be an increase in train speed and frequency from the existing use.

Proposed improvements to the New Bedford Main Line rail segment under all Build Alternatives would result in the loss of potential habitat of eight state-listed species that are known to be present within the Priority Habitats crossed by this segment.[35] These species are: eastern box turtle, mocha emerald, Hessel's hairstreak, long-leaved panic-grass, coastal swamp amphipod, pale green pinion moth, mocha emerald and water-willow stem borer moth. Because the polygon covers an extensive area and crosses several diverse habitats, existing conditions are described for individual segments within the polygon.

Northern Limit to Padelford Street—This segment (Figure 4.15-23) is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles.

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement. The bridge over the Cotley River would be reconstructed to enhance fish and wildlife passage.

Padelford Street to Myricks Street—This segment (Figure 4.15-23) is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road may be used for nesting although they do not provide optimal habitat due to the dense and stony substrate. The existing tracks are a barrier to the movement of eastern box turtles.

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement. Box turtle movement may be enhanced, as there is one

[35] NHESP letter dated January 8, 2009.

culvert in this segment that would be reconstructed to meet Commonwealth of Massachusetts Stream Crossing Standards.[36]

Myricks Street to Malbone Street—This segment (Figure 4.15-23) is bordered by areas of marginally suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles.

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement.

Malbone Street to Southern Limit Assonet Cedar Swamp—This section extends for 1.7 miles (Figure 4.15-24), and is an active freight railroad. The railbed was constructed for a double track, and currently contains a single track and a maintenance roadway. The railbed is an elevated berm above wetlands for much of its length, passing through a complex of deciduous forested wetlands, Atlantic white cedar swamp, and more open shrub-dominated swamp. Two perennial streams (Pierce Brook and the Cedar Swamp River) cross under the railbed and may provide habitat for the mocha emerald (*Somatochlora linearis*).

This segment is bordered by some areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. The adjacent wetlands also provide habitat for Hessel's hairstreak (in Atlantic white cedar trees) and the mocha emerald dragonfly may breed in adjacent streams.

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement. Box turtle movement may be enhanced, as there are culverts in this segment that would be reconstructed to meet Commonwealth of Massachusetts Stream Crossing Standards,[37] between-the-ties crossings would be added, and the Cedar Swamp River bridge would be reconstructed with wildlife shelves.

Reconstructing the railbed would result in some wetland impact in this section, affecting the habitat of Hessel's hairstreak. Atlantic white cedars are present at low to medium densities in Wetland LK-6, east of the railbed, between the Pierce Brook and the Cedar Swamp River. The northernmost trees are located at wetland flag LK6 219 (STA 2184+50), and are approximately 6 feet east of the wetland flag. The southernmost trees are located at the Cedar Swamp River, LK6-101 (STA 2225). The Atlantic white cedar community spans a distance of approximately 4,000 linear feet. Trees are primarily growing on the east side of the perimeter ditch, 5 to 6 feet west of the wetland flags. There are occasional trees on the railbed side of the ditch. The Atlantic white cedars occur at low densities within a predominantly red maple forested wetland, and co-occur with tupelo, white pine, highbush blueberry, dangleberry , sweet pepperbush, and greenbriar (*Smilax rotundifolia*). The number of trees observed on, or within 10 feet of the railbed along this 4,000 foot distance were not counted. Trees were generally single, or in groups of three to five, and spaced 50 to 100 feet apart.

[36] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

[37] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

None of the proposed filled wetland within this segment provides suitable habitat for the mocha emerald. Improving culverts and bridges within this segment could have temporary construction-period impacts to mocha emerald habitat, but would result in an overall improvement by replacing culverts with open-bottom structures.

Howland Road Area (PH 1158/EA 372)—This segment (Figure 4.15-24) is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. There are no open coastal plain pond or sandy wetland habitats adjacent to the railbed that provide suitable habitat for long-leaved panic-grass. Within the portion of the polygon (PH1158) crossed by the New Bedford Main Line, one data-sensitive species is also known to be present.[38]

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement.

Acushnet Cedar Swamp (PH 1349/EH 1)—The polygon with Priority Habitat (PH1349) includes the Acushnet Cedar Swamp State Reservation, which is an approximately 1,000-acre property located in New Bedford and Dartmouth, north of the New Bedford Airport (Figures 4.15-25-26). Within the part of the Acushnet Cedar Swamp and adjacent areas crossed by the New Bedford Main Line, four state-listed species (eastern box turtle, coastal swamp amphipod, pale green pinion moth, and water-willow stem borer moth) are known to be present.[39]

This polygon extends for approximately 3 miles through Freetown and New Bedford. Because the polygon covers an extensive area and crosses several diverse habitats, existing conditions are described for individual segments within the polygon.

Northern Limit Acushnet Cedar Swamp to Chipaway Road—This 1,600-foot section (Figure 4.15-25) is an active freight railroad segment is bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. Ditches and wetlands adjacent to the right-of-way may provide suitable habitat for the coastal swamp amphipod. Adjacent wetlands may also provide suitable habitat for the pale pinon moth and the water-willow stem borer moth.

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement.

Reconstructing the railbed would result in some wetland impact in this section, potentially affecting the habitat of the three invertebrate species. Approximately 100 square feet of suitable wetland habitat would be temporarily altered for construction.

The impact to water-willow stem borer moth and pale green pinion moth habitat would be mitigated by restoring the altered wetlands within the Acushnet Cedar Swamp segment with the appropriate host plant species (water-willow, highbush blueberry, winterberry, sweet pepperbush).

[38] NHESP letter dated January 8, 2009.
[39] NHESP letter dated January 8, 2009.

Chipaway Road to Samuel Barnett Boulevard—This 1.2 mile section (Figure 4.15-25) is an active freight railroad segment bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles. Ditches and wetlands adjacent to the right-of-way may provide suitable habitat for the coastal swamp amphipod. Adjacent wetlands may also provide suitable habitat for the pale pinon moth and the water-willow stem borer moth.

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement.

Reconstructing the railbed would result in some wetland impact in this section, potentially affecting the habitat of the three invertebrate species. Approximately 11,691 square feet of forested and shrub-dominated wetland in four wetlands would be lost due to filling, and an additional 6,899 square feet of wetland habitat would be temporarily altered for construction.

The impact to water-willow stem borer moth and pale green pinion moth habitat would be mitigated by restoring the altered wetlands within the Acushnet Cedar Swamp segment (6,899 square feet) with the appropriate host plant species (water-willow, highbush blueberry, winterberry, sweet pepperbush).

Samuel Barnett Boulevard to Route 140—This 1.5 mile section (Figure 4.15-25-26) is an active freight railroad segment bordered by areas of suitable upland habitat for eastern box turtle. The open soils of the maintenance road, although dense and stony, may be used for nesting although they do not provide optimal habitat. The existing tracks are a barrier to the movement of eastern box turtles (although it is unlikely that box turtles occur east of the right-of-way due to extensive development). Ditches and wetlands adjacent to the right-of-way may provide suitable habitat for the coastal swamp amphipod. Adjacent wetlands may also provide suitable habitat for the pale pinon moth and the water-willow stem borer moth.

A transfer power substation is proposed in this segment, immediately south of the powerline right-of-way that parallels Samuel Barnet Boulevard. This would result in the loss of 1.25 acres of potential eastern box turtle habitat.

Reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement. Reconstructing the railbed would result in some wetland impact in this section, potentially affecting the habitat of the three invertebrate species. Approximately 1,043 square feet of forested and shrub-dominated wetland in one wetland would be lost due to filling, and an additional 2,859 square feet of suitable wetland habitat would be temporarily altered for construction. Improving culverts within this segment could have temporary construction-period impacts to coastal swamp amphipod habitat, but would result in an overall improvement by replacing culverts with open-bottom structures.

The impact to water-willow stem borer moth and pale green pinion moth habitat would be mitigated by restoring the altered wetlands within the Acushnet Cedar Swamp segment (2,859 square feet) with the appropriate host plant species (water-willow, highbush blueberry, winterberry, sweet pepperbush).

Indirect Impacts of the Rail Build Alternatives: New Bedford Main Line Rail Segment

Upgrading New Bedford Main Line Rail Segment would result in marginal loss of nesting, foraging, and wintering habitat for rare species. There would be no habitat fragmentation because losses would be limited to narrow strips at the edge of the existing railroad ballast. The loss of a small percentage of habitat is not anticipated to affect the long-term persistence of these species populations given the large area of suitable habitat for these species in, and in the vicinity of, the project areas. This is especially the case for eastern box turtles which are habitat generalists and can use other adjacent areas, such as cleared land and scrub-shrub, as basking and foraging habitat.

This alternative would require modification and reconstruction of freight rail bridges across the Taunton River, potentially with temporary impacts to Atlantic sturgeon (*Acipenser oxyrhinchus*) habitat. On December 4, 2008, a letter was submitted to the National Marine Fisheries Service (NMFS) requesting information on any threatened and endangered fisheries resources located within the project area. The response from NMFS received on January 12, 2009, stated that there are no federally endangered fisheries resources present in the Taunton River. Although Atlantic sturgeons are known to be present in the Taunton River during the summer months, they are typically found at the mouth of the river with occasional reports of sturgeon venturing further upstream. NMFS noted that it is unlikely that this species occurs in the vicinity of the proposed project (see correspondence in Appendix 4.15-A).

Since the publication of the DEIS, the New York Bight Distinct Population Segment of Atlantic sturgeon was listed as endangered species under the ESA by the NMFS on April 6, 2012.[40] Therefore, the Corps coordinated with NMFS to determine whether the Build Alternatives would affect this species. However, the NMFS stated in their May 13, 2013 response letter it is unlikely that any species listed under their jurisdiction will be exposed to any direct or indirect effects of the proposed South Coast Rail project, including the Atlantic sturgeon (see correspondence in Appendix 4.15-A). Therefore, further Section 7 consultation with NMFS is not necessary.

In addition, NHESP, in their comment letter on the ENF[41] and in subsequent consultations, has not identified adverse impacts to the Atlantic sturgeon.

Indirect impacts to rare species associated with improvements to the New Bedford Main Line Rail Segment under the Build Alternatives include:

- Improvements to migration for terrestrial wildlife, because reconstructing these tracks presents opportunities to reconstruct existing culverts or bridges to improve wildlife passage (e.g., eastern box turtle) and reduce fragmentation.
- Increase in turtle mortality from being struck by trains if they are able to climb the rail, although this is unlikely because the steel rails represent physical barriers not easily climbed by turtles.
- At grade crossings, when moving between habitats, turtles could die of dehydration if they are trapped between the rails.

[40] Federal Register: February 6, 2012 (Volume 77, Number 24, page 5880-5912), Endangered and Threatened Wildlife and Plants; Threatened and Endangered Status for Distinct Population Segments of Atlantic Sturgeon in the Northeast Region.

[41] Executive Office of Transportation and Public Works, *South Coast Rail Environmental Notification Form*, November 2008.

- Potential increase in mortality of rare species near streams or wetland habitat (mocha emerald, Hessel's hairstreak, coastal swamp amphipod, pale green pinion moth) caused by the use of herbicides. Adherence to the approved Vegetation Management Plan (VMP), as implemented with its YOPs, restricts the use of herbicides in areas adjacent to wetlands or sensitive resources, which would thus reduce such impacts

The habitat requirements of the data-sensitive species found within Priority and Estimated Habitat (PH1158/EH372) have been evaluated, and none occur within or adjacent to the right-of-way. As there are no proposed impacts to habitat of this species, no short- or long-term impacts to such species are anticipated.

Fall River Secondary Rail Segment

The Fall River Secondary rail segment would require upgrading and reconstruction of the existing freight rail tracks (Figures 4.15-27-29). Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one in Freetown (Freetown). Double-track segments would be constructed in the vicinity of these two stations, while the remainder of the corridor would be maintained as a single-track. Under the electrification alternatives, two traction power stations would be built along this track segment. Traction power stations are small facilities (each approximately one acre or less) that are required at periodic intervals along an electrified rail corridor in order to provide connections to the electricity grid. On the Fall River Secondary, Weaver's Cove East is the favorable location to site a Fall River layover facility.

Based on the 2008 NHESP Atlas, the Fall River Secondary crosses one NHESP Priority and Estimated Habitat (PH1093/EH951). This section of the right-of-way includes several small wetlands along the Assonet River (Figure 4.15-27-29). There are no ACECs crossed by the Fall River Secondary rail segment. The following sections describe both direct and indirect impacts as they relate to the Fall River Secondary rail segment.

Direct Impacts of Rail Build Alternatives: Fall River Secondary Rail Segment

The Fall River Secondary rail segment proposed for use under all Build Alternatives is an active rail road and the majority of the improvements for the Build Alternatives would occur within the footprint of the existing track. Minor temporary and permanent impacts may occur within narrow strips immediately adjacent to the right-of-way as necessary for track reconstruction and minor re-alignment of track segments in certain areas. The only major change would be an increase in train speed and frequency.

Within the part of the Assonet Cedar Swamp (PH1093) and adjacent areas crossed by the Fall River Secondary rail segment, the following three state-listed species are known to be present:[42] eastern box turtle, mocha emerald, and Hessel's hairstreak.

Mitigation for the barrier effect would likely be provided by:

- Reconstructing culverts to meet Commonwealth of Massachusetts Stream Crossing Standards[43]

[42] NHESP letter dated January 8, 2009.

[43] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

- Reconstructing the Cedar Swamp River bridge with wildlife shelves (see Figure 4.14-21a in Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*)

None of the wetlands to be filled provide suitable habitat for the mocha emerald. Improving culverts and bridges within this segment could have temporary construction-period impacts to mocha emerald habitat, but would result in an overall improvement by replacing restricted culverts with open-bottom structures. Reconstructed culverts and other crossings would be designed so as to prevent secondary drainage or other negative alterations to the delicate hydrology of the sensitive wetlands on either side of the right-of-way.

Indirect Impacts of Rail Build Alternatives: Fall River Secondary Rail Segment

Upgrading this track would result in marginal loss of nesting, foraging, and wintering habitat for rare species. Analysis by NHESP confirms that improvements to the Fall Secondary rail segment would result in relatively minor impacts to state-listed species. There would be no habitat fragmentation because all habitat losses would be narrow strips at the edge of the existing railroad ballast. The loss of a small percentage of habitat is not anticipated to affect the long-term persistence of these species populations given the large area of suitable habitat for these species in, and in the vicinity of, the project areas. This is especially the case for eastern box turtles which are habitat generalists and can use other adjacent cleared and scrub-shrub areas as basking and foraging habitat

Indirect impacts to rare species associated with this alternative include:

- Improvements to migration for terrestrial wildlife, because reconstructing these tracks presents opportunities to reconstruct existing culverts or bridges to improve wildlife passage (e.g., eastern box turtle) and reduce fragmentation. During final design, each culvert or bridge that would be removed or replaced would be analyzed in order to avoid causing hydrologic changes.

- Increase in turtle mortality resulting from being struck by trains if they are able to climb the rail, but this is not expected to occur frequently because the steel rails are not easily climbed by turtles.

- At grade crossings, when moving between habitats, turtles could die of dehydration if they are trapped between the rails and are not able to get out.

- Potential increase in mortality of rare species near streams or wetland habitat (e.g., mocha emerald and Hessel's hairstreak) caused by the use of herbicides. Adherence to an approved Vegetation Management Plan (VMP), as implemented in conjunction with Yearly Operating Plans (YOP), restricts the use of herbicides in areas adjacent to wetlands or sensitive resources and would thus reduce such impacts.

Summary of Southern Triangle Impacts

As shown in Table 4.15-7, improvements to the existing railbed would result in the permanent loss of 1.3 acres of wetland and require the temporary alteration of 0.9 acre of wetland, in 16 wetlands. In three locations (Wetland LK-7 on the New Bedford Main Line; Wetland LKF-1, and Wetland FRF-1B on the Fall River Secondary) culverts conveying perennial or intermittent streams under the berm would be extended. Bridges over the Cedar Swamp River would be reconstructed, with no work in the water. While portions of Southern Triangle are bordered by areas of suitable upland habitat for eastern box

turtle, the existing tracks are a barrier to the movement of eastern box turtles. Accordingly, reconstructing the existing railbed and tracks would not result in the loss of eastern box turtle habitat nor create a barrier to box turtle movement.

Table 4.15-7 Southern Triangle Impacts within Estimated and Priority Habitat

Location/Species	Upland Habitat Loss (ac)	Wetland	Wetland Loss (sf)	Temporary Construction Impact (sf)	Comments
New Bedford Main Line - Assonet Cedar Swamp (PH1093)					
Mocha emerald (*Somatochlora linearis*)	NA[1]	BK-1	9,903	4,178	No impact to habitat
Hessel's hairstreak *(Callophrys hesseli)*	NA	LK-4	2,499	1,503	No impact to habitat
		LK-7	23,608	17,267	No impact to habitat
Total[1]	NA		36,010	22,948	
Fall River Secondary - Assonet Cedar Swamp (PH1093)					
Mocha emerald (*Somatochlora linearis*)	NA	BK-2B	5,963	1,721	Forested wetland
	NA	BK-7	414	1,336	Forested wetland
	NA	LKF-1	0	0	Intermittent stream, bank impact only
	NA	LKF-2	2,043	2,500	Forested wetland
	NA	LKF-3	109	193	Forested wetland
	NA	LKF-4	307	514	Forested wetland
	NA	LKF-1A	638	335	Shrub swamp
	NA	FRF-1B	0	0	Intermittent stream, bank impact only
Total	NA		9,474	6,406	
New Bedford Main Line and Fall River Secondary - Acushnet Cedar Swamp (PH1349)					
Coastal swamp amphipod (*Synurella chamberlaini*)	NA	NB-2	1,045	928	Forested wetland
Water-willow stem borer moth (*Papaipema sulphurata*)	NA	NB-6	2,012	1,010	Forested wetland
Pale green pinion moth (*Lithophane viridipalle*)	NA	NB-8	1,567	1,139	Forested wetland
	NA	NB-10	7,067	3,822	Forested wetland
	NA	NB-22	1,043	2,859	Forested wetland
Eastern box turtle (*Terrapene carolina carolina*)	1.25	NA	0	0	Successional upland vegetation
Total[2]	NA		11,691	9,758	

1 Not applicable, no loss of suitable habitat.
2 Inclusive of all species listed under each location.

Long-leaved panic-grass is known to occur within the polygon that includes a wooded swamp area and the Cedar Swamp River (PH1158). Long leaved panic grass is associated with coastal plain pond shore communities, and occurs in moist open sandy habitats on the coastal plain. No suitable habitat has been identified in proximity to the rail right-of-way.

Stoughton Electric Alternative

The Stoughton Electric Alternative north of the Southern Triangle would be comprised of a portion of the Northeast Corridor and the Stoughton Line (Figures 4.15-12-15). This alternative would use the Northeast Corridor from South Station to Canton Junction. At Canton Junction, trains would continue on the existing, active Stoughton Line as far south as the relocated Stoughton Station. Commuter rail service would be extended south from Stoughton Station, using an out-of-service railroad bed, through Raynham Junction to Weir Junction in Taunton. This alignment joins the New Bedford Main Line at Weir Junction, the northern end of the Southern Triangle. This evaluation focuses on the existing and the extended Stoughton Line segment. The Priority and Estimated Habitats crossed by the Northeast Corridor north of Canton Junction would not be impacted under the Stoughton Alternative.

The existing Stoughton Line commuter rail track from Canton Junction to Stoughton would be upgraded for the Stoughton Electric Alternative. This includes improvements to existing active freight or rail lines from Canton Junction to Stoughton Station, and from Dean Street to Weir Junction. This alternative also requires track construction on out-of-service or abandoned rights-of-way between Stoughton Station and Dean Street.

One existing train station along the Stoughton Line would be reconstructed (Canton Center) and six new train stations would be constructed (Stoughton, Easton Village, North Easton, Raynham Park, Taunton, and Taunton Depot). Three traction power stations would be built along this track segment. No new layover facilities would be constructed along this segment. Potential impacts to rare species from reconstructing the existing and developing the new stations are discussed later in this section.

Based on the 2008 NHESP Atlas, the Stoughton Line crosses two Priority and Estimated Habitats (PH1392/EH59 and PH1297/EH1077). These Priority habitats include land within the Hockomock Swamp ACEC and Pine Swamp respectively. The following sections describe both direct and indirect impacts as they relate to this alternative; the two Southern Triangle components were previously discussed.

Direct Impacts of the Stoughton Electric Alternative: Stoughton Rail Segment

The alignment of the proposed Stoughton Alternative follows a previously developed railroad corridor. Minor temporary and permanent impacts may occur within narrow strips immediately adjacent the right-of-way during track reconstruction and re-alignment. Most of the impacts are expected along the track construction on out-of-service or abandoned rights-of-way between Stoughton Station and Dean Street.

The Stoughton Alternative would result in the loss of potential habitat of five state-listed species (Blanding's turtle; eastern box turtle; blue-spotted salamander, gypsywort and Hessel's hairstreak) and would interrupt a migratory corridor used by turtles and blue-spotted salamanders (Table 4.15-8). These species are known to be present within the Priority Habitats crossed by this segment.[44]

[44] NHESP letter dated January 8, 2009.

Table 4.15-8 Stoughton Alternative Impacts within Estimated and Priority Habitat

Location/Species	Upland Habitat Loss (ac)	Wetland (ID)	Wetland Loss (sf)	Temporary Construction Impact (sf)	Comments
Stoughton Alternative-Hockomock Swamp Area (PH1392)					
Blanding's turtle (*Emydoidea blandingii*)	12.5	EA-77	0	217	Forested and shrub wetland bordering intermittent stream CVP 1665
Blue-spotted salamander (*Ambystoma laterale*)	7.5	EA-77	0	217	Forested and shrub wetland bordering intermittent stream CVP 1665
Eastern box turtle (*Terrapene carolina carolina*)	11.4	NA[1]	NA	NA	Successional upland vegetation, unvegetated gravel railroad berm, impede movement
Stoughton Alternative-Pine Swamp Area (PH1297)					
Hessel's hairstreak *(Callophrys hesseli)*	NA	R-12.2	18,578	14,537	Forested wetland containing Atlantic White Cedar – estimated loss of 35 trees

1 Not applicable, no loss of suitable habitat.

Hockomock Swamp ACEC (PH1392)—This polygon extends for a total of 5.5 miles from Purchase Street in Easton to I 495 in Raynham. The polygon with Priority Habitat (PH1392) includes the Hockomock Swamp ACEC, which is approximately 16,950 acres of land in Bridgewater, Easton, Norton, Raynham, Taunton, and West Bridgewater (Figures 4.15-21-22). The ACEC is fragmented by several major transportation corridors, including Route 24, I-495, Route 138, Route 106, and other major roadways, and the railroad right-of-way itself, and it includes substantial upland areas within the watershed of the Hockomock Swamp. These uplands include land developed in commercial and residential uses as well as undeveloped forested upland and farmland.

The DCR describes the ACEC as one of the most extensive inland wildlife habitats in southeastern Massachusetts. The Atlantic white cedar swamp and acidic fen wetland communities scattered throughout the Hockomock Swamp ACEC are considered to be outstanding examples of these unique natural communities. Within the part of the ACEC crossed by the Stoughton Alternative, four state-listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, and gypsywort) are known to be present.[45] The Atlantic white cedar stands also provide potential habitat for Hessel's hairstreak. Because the polygon covers an extensive area and crosses several diverse habitats, existing conditions are described for individual segments within the polygon.

Purchase Street to Prospect Street—The railroad right-of-way within this 0.75 mile section (Figure 4.15-21) consists of a narrow (6 feet wide) gravel pathway on the former railbed. This segment is bordered by

[45] NHESP letter dated January 8, 2009.

areas of suitable upland habitat for eastern box turtle. Eastern box turtles, if present, may move across the right-of-way to access suitable habitat areas on either side. NHESP also considers this segment to be within the potential habitat of Blanding's turtles.

Reconstructing the railbed would result in the loss of vegetation along the edges of the path that may provide cover for turtles (3.1 acres) and would create a barrier to the movement of turtles between potential habitats east and west of the railbed.

Prospect Street to Foundry Street—The railroad right-of-way within this 0.9 mile section (Figure 4.15-21) consists of a 10-foot wide gravel pathway on the former railbed (with evidence of use by ATVs). For the northern 0.3 mile, the right-of-way is bordered by forested upland and wetland on the west, associated with Black Brook, and by a golf course on the east. For the next 0.3 mile, the right-of-way passes between two golf courses. The southern third passes between two large wetlands (EA 82, EA 81). A certified vernal pool is east of the right-of-way just north of Foundry Street. During the 2001 field study, a single blue-spotted salamander was trapped in this area.

This segment is bordered by areas of suitable upland habitat for eastern box turtles and wetlands potentially used by Blanding's turtles. Sandy soils in the golf courses may provide nesting habitat for either turtle species, which, if present, may move across the right-of-way to access suitable habitat areas on either side.

Reconstructing the railbed and track within this section would create a barrier to the movement of Blanding's turtles between the two golf courses and potentially suitable habitat on either side of the right-of-way. This would also create a barrier to the movement of blue-spotted salamanders in the southernmost 800 feet of this section.

Reconstructing the railbed would also result in the loss of vegetation, where the right-of-way is not occupied by a dirt path. The path in this section averages 10 feet wide. The loss of natural vegetation providing cover to turtles would be approximately 2.8 acres; the loss of natural vegetation providing cover or upland habitat for blue-spotted salamanders would be 0.7 acre.

Mitigation for the barrier effect would likely be provided by:

- Reconstructing the Black Brook bridge with wildlife shelves
- Reconstructing culverts to meet Commonwealth of Massachusetts Stream Crossing Standards[46]
- Installing between-the-ties crossing structures
- Installing wildlife crossing culverts

Foundry Street to Power Line—The railroad right-of-way within this 0.6 mile section (Figure 4.15-21) consists of a wide gravel pathway on the former railbed (with evidence of use by ATVs. The right-of-way passes through a white pine forested upland and deciduous forested upland and wetlands (EA 77, EA 78) in the northern half and deciduous forested wetland (EA 63, EA 64) in the southern half. Several certified

[46] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

vernal pools are within this section, on both sides of the railbed. At the southern end of this section, the railbed crosses a right-of-way for an overhead power line and the powerline maintenance road. The railbed consists of an open, wide sandy road adjacent to wetlands dominated by woody shrubs and Phragmites.

This segment is bordered by areas of suitable upland habitat for eastern box turtle, wetlands potentially used by Blanding's turtle, and vernal pools used as breeding habitat by blue-spotted salamanders. Sandy soils in the gravel pit, or in the ballfield, may provide nesting habitat for either turtle species. All three species may move across the right-of-way to access suitable habitat areas on either side.

The northernmost 1,200 feet of this segment would be the approach to the trestle. In this approach segment, the track would slope up, and retaining walls would be used to minimize fill. A traction power substation would be constructed east of the right-of-way, within an area of white pine forest or in the ballfield. The track would be on the trestle for the majority of this section, and the only impacts would result from vegetation removal. Reconstructing the railbed and track within the northernmost 1,200 feet of this section would create a barrier to the movement of Blanding's turtles and blue spotted salamanders. However, these species could cross through the enhanced culvert or could walk south and pass under the trestle, guided by the retaining walls.

Reconstructing the railbed and constructing the trestle would also result in the loss of vegetation, where the right-of-way is not occupied by a dirt path. The path in this section averages 15 feet wide (the width ranges from 10 to 30 feet). The loss of natural vegetation providing cover to turtles or salamanders would be approximately 1.6 acres. There would be no wetland impacts in this section, except as needed to reconstruct the culvert connecting wetlands EA-77 and EA-78 (both of which contain vernal pools).

Mitigation for the barrier effect would likely be provided by:

- Reconstructing the culvert to meet Commonwealth of Massachusetts Stream Crossing Standards[47]
- Retaining walls would guide animals around the at-grade section north of the trestle
- Daylighting culverts in this segment (beneath the proposed trestle)

Power Line to Former Raynham Greyhound Park—The railroad right-of-way within this 1.7 mile section (Figures 4.15-21-22) consists of a wide gravel pathway on the elevated former railbed (with evidence of use by ATVs). The railbed passes through primarily forested red maple-dominated wetlands, although there is an open emergent marsh and shrub swamp west of the railbed (south of the powerline), a large vernal pool east of the railbed, and an Atlantic white cedar swamp located entirely west of the railbed and extending for approximately 0.6 mile north of the Raynham Greyhound Park. Several vernal pools occur within this section.

This segment is bordered by wetlands potentially used by Blanding's turtles, wetlands and uplands potentially used by eastern box turtles, and vernal pools used as breeding habitat by blue-spotted salamanders. Sandy soils under the powerline may provide nesting habitat for either turtle species. All three species may move across the right-of-way to access suitable habitat areas on either side.

[47] Ibid.

Gypsywort occurs in the open emergent wetland west of the railbed, south of the power line. There would be no impact to this population.

Reconstructing the railbed would result in the loss of upland forest vegetation, where the right-of-way is not occupied by a dirt path. The path in this section averages 10 feet wide. The loss of natural vegetation providing cover to turtles or salamanders would be approximately 5 acres.

The southernmost section of this segment would be the approach to the trestle. In this approach segment, the track would be at-grade, sloped up to the trestle. Although there would be impacts to wetlands north of the Raynham Greyhound Park road crossing, these wetlands do not provide habitat for Blanding's turtle, eastern box turtle, or blue-spotted salamander. One culvert in this section would be reconstructed to meet Commonwealth of Massachusetts Stream Crossing Standards.[48]

Although the trestle does not affect wildlife movement, the six culverts within the trestle section would be "daylighted" to improve their function as wildlife crossings.

Former Raynham Greyhound Park to Bridge Street—The railroad right-of-way within this 1.1 mile section (Figure 4.15-22) is within a cut through the landscape, making the right-of-way a topographic low point. It consists of a wide gravel roadway on the former railbed, with evidence of extensive use by ATVs. The northernmost 1,400 feet of this section is bordered to the east by an industrial park, with a detention basin that drains onto the right-of-way. An existing stream (formerly an agriculture drainage ditch) flowing from the west drains into a ditch on the west side of, and parallel to, the track. This drainageway has become blocked, and thus the combined flow from the ditch and the detention basin on the east, has been identified as a perennial stream flowing north within the railbed. The railbed passes through primarily upland forest, and passes through one small wetland system (R 61, R 59). A maintained powerline is located on the east side of the railbed. A complex of potential vernal pools occurs on both sides of the railbed approximately 1,500 feet north of Bridge Street.

This segment is bordered by areas of suitable upland habitat for eastern box turtle. Eastern box turtles, if present, may move across the right-of-way to access suitable habitat areas on either side.

Reconstructing the railbed and track within this section would create a barrier to the movement of eastern box turtles between potentially suitable habitat on either side of the right-of-way. Reconstructing the railbed would also result in the loss of vegetation, where the right-of-way is not occupied by a dirt path. The path in this section averages 10 feet wide. The loss of natural vegetation providing cover to turtles would be approximately 11.4 acres as calculated by NHESP, including the gravel pathway.

Mitigation for the barrier effect would likely be provided by installing between ties crossing structures.

Bridge Street to I-495—The railroad right-of-way within this 0.25 mile section consists of a wide gravel path on the former railbed. The railbed is bordered by a small park and ballfield to the east, and by residential development on both sides. Elm Street crosses the right-of-way mid-way between Bridge Street and the highway.

[48] Ibid.

Although included in the priority habitat polygon, this segment is not bordered by areas of suitable upland habitat for eastern box turtle. Accordingly, there are no impacts to eastern box turtle in this section.

Pine Swamp (PH1298)—The railroad right-of-way through Pine Swamp, between King Phillip Street and East Britannia Street (Figure 4.15-22), is on an elevated berm for the northern 0.5-mile section and at-grade in the southern section. The railbed contains a narrow (3 to 4 feet wide) path and a powerline owned by the Taunton Municipal Light Company. The northernmost 500 feet is bordered by residential development on the west side. An auto junkyard is east of the right-of-way at the East Britannia Street crossing. The railbed and adjacent powerline are predominantly vegetated with shrubs and herbaceous species, including giant reed grass. Adjacent areas are forested or shrub-dominated wetlands (including a large stand of giant reed grass). The forested wetland east of the railbed is dominated by deciduous trees, while the forested wetland west of the railbed is dominated by Atlantic white cedar.

Atlantic white cedar trees, present in the wetland west of the railbed and on the railbed itself, provide breeding habitat for the Hessel's hairstreak butterfly. Atlantic white cedars are present at low densities in Wetland RA12.2, west of the railbed, between the southern Pine Swamp Brook crossing and the northern Pine Swamp Brook crossing. The southernmost trees are located at wetland flag RA12.2-154 (STA 1729), and are approximately 6 feet west of the wetland flag. The northernmost trees are located at wetland flag RA12.2-138 (STA 1711). The Atlantic white cedar community spans a distance of approximately 1,800 linear feet. Trees are primarily growing on the west side of the perimeter ditch, 5 to 6 feet west of the wetland flags. There are occasional trees on the railbed side of the ditch. The Atlantic white cedars occur at low densities within a predominantly red maple forested wetland, and co-occur with tupelo, white pine, highbush blueberry, dangleberry), sweet pepperbush, and poison sumac . A total of 35 trees were observed on, or within 10 feet of the railbed along this 1,800 foot distance.

Reconstructing the railbed would result in the loss of vegetation, where the right-of-way is not occupied by a dirt path. The path in this section averages 3 to 4 feet wide. The loss of natural vegetation containing Atlantic white cedars would be approximately 18,578 square feet, and approximately 14,537 square feet of wetland would be temporarily altered for construction. This work would result in the loss of approximately 35 Atlantic white cedar trees (the habitat of Hessel's hairstreak).

This impact would be mitigated by restoring the altered wetlands within the Pine Swamp segment (14,537 square feet) with Atlantic white cedars.

The Stoughton Line would potentially impact rare species habitat within the Hockomock Swamp ACEC, which encompasses most of Priority and Estimated Habitat polygon (PH1392/EH59). Habitat potentially used by Blanding's turtle, eastern box turtle, blue-spotted salamander, gypsywort and Hessel's hairstreak would be impacted within the Hockomock Swamp ACEC. An additional 11 state-listed species occur within the Hockomock Swamp polygon (PH1392/EH59). Other rare species and their habitat may occur within the polygons or within the contiguous ACECs.

Gypsywort (*Lycopus rubellus*)—The proposed Stoughton Alternative is not anticipated to have any adverse effect on the existing population or habitat of gypsywort, and not likely to result in a "take." The known population is within a wetland adjacent to the railroad berm through the Hockomock Swamp, where the restored tracks would be on an elevated trestle. No work would occur in the wetland where this species occurs.

Hessel's Hairstreak Butterfly (*Callophrys hesseli*)—The proposed Stoughton Alternative would not result in a "take" of Hessel's hairstreak as a result of the loss of breeding habitat (Atlantic white cedar trees) in Pine Swamp. The proposed project would require that the tracks be reconstructed through Pine Swamp. This would require that the existing berm be reconstructed with placement of sub-ballast, ballast, ties and track. As shown in Figure 4.15-22, impacts have been minimized through the use of reinforced earth slopes. However, there would be unavoidable impacts to wetlands containing Atlantic white cedar trees, as well as Atlantic white cedar trees growing on the existing upland berm. However, no Atlantic white cedar swamp would be affected in the Assonet Cedar Swamp. The total estimated loss of habitat for Hessel's hairstreak (wetland [R 12.2] and upland) is approximately 35 Atlantic white cedar trees, assuming the impacted areas are utilized by the Hessel's hairstreak.

Mocha Emerald Dragonfly (*Somatochlora linearis*)—The proposed Stoughton Alternative would result in minor impacts to potential mocha emerald dragonfly habitat within the Assonet Cedar Swamp polygon but would not result in a "take" as determined by NHESP. Improvement to the existing railbed would result in the permanent loss of 1.04 acres of wetland and could require the temporary alteration of an additional 0.7 acre of wetland. These losses of wetlands would be in narrow strips at the existing edge of the railroad berm.

Pale Green Pinion Moth (*Lithophane viridipalle*)—The proposed Stoughton Alternative would result in minor impacts to potential pale green pinion moth habitat within the Acushnet Cedar Swamp polygon but would not result in a "take" as determined by NHESP. Proposed improvements to the existing railbed would result in the permanent loss of 0.26 acre of wetland and could require the temporary alteration of an additional 0.22 acre of wetland, in five wetlands. This loss of wetlands would be in a narrow strip at the existing edge of the railroad berm.

Water-willow Stem Borer Moth (*Papaipema sulphurata*)—The proposed Stoughton Alternative would result in minor impacts to potential water-willow stem borer moth habitat within the Acushnet Cedar Swamp polygon but would not result in a "take" as determined by NHESP. Improvements to the existing railbed would result in the permanent loss of 0.26 acre of wetland and could require the temporary alteration of an additional 0.22 acre of wetland, in five wetlands. This loss of wetlands would be in a narrow strip at the existing edge of the railroad berm.

Coastal Swamp Amphipod (*Synurella chamberlaini*)—The proposed Stoughton Alternative would result in minor impacts to potential coastal swamp amphipod habitat within the Acushnet Cedar Swamp polygon but would not result in a "take" as determined by NHESP. The proposed improvements to the existing railbed would result in the permanent loss 0.26 acre of wetland and could require the temporary alteration of an additional 0.22 acre of wetland, in five wetlands. This loss of wetlands would be in a narrow strip at the existing edge of the railroad berm.

Blue-spotted Salamander (*Ambystoma laterale*)—The proposed Stoughton Alternative would result in a "take" of blue-spotted salamander as a result of reconstructing the railbed between Foundry Street and the powerline. Although the reconstruction would not result in the loss of vernal pool habitat used for reproduction, there would be a loss of 7.5 acres of forested upland habitat potentially used as non-breeding and overwintering habitat for construction of the transfer power substation south of Foundry Street. Constructing the tracks at grade and on the approach to the trestle would create a barrier to the movement of salamanders between breeding and non-breeding habitat along approximately 1,500 feet of this section, and an additional 800 feet north of Foundry Street. The remaining length of the railbed would continue to allow unimpeded movement across the berm.

Considering blue-spotted salamanders are rarely encountered above ground, except as adults during their early spring breeding season, or as metamorphosed juveniles in the late summer, limiting proposed work in know areas where this species is present during these periods may minimize impacts to this species. Furthermore, the installation of between-the-ties crossing structures and other mitigation measures would aid in minimizing impacts to this species.

Construction of the approach to the trestle at the northern end would require temporarily impacting approximately 217 square feet of Wetland EA-77, a forested and shrub-dominated wetland bordering an intermittent stream. This wetland contains a vernal pool and provides breeding habitat for vernal pool amphibians.

Construction of the trestle would result in the loss of natural vegetation adjacent to vernal pools, which has the potential to affect water temperature and detrital influxes. However, the loss of canopy would be restricted to one side of each vernal pool and would not affect the capacity of the pool to continue to provide breeding habitat. In addition, the approximately north-south orientation of the right-of-way would limit means that remnant trees would provide adequate shade except during the few hours before and after noon.

Blanding's Turtle (*Emydoidea blandingii*)—The principal effect of the Stoughton Alternative to Blanding's turtles would be to impede the movement of turtles from east to west, particularly in the area where golf courses abut the rail right-of-way on both sides. This could potentially affect access between adult habitat and nesting habitats. There would be no fill in wetlands that provide potential Blanding's turtle habitat (deep marshes or pools with shrub cover). The proposed Stoughton Alternative would require that the out-of-service tracks be reconstructed through the area identified as potential Blanding's turtle habitat. The track would be reconstructed at-grade from Depot Street to approximately 0.28 mile south of Foundry Street. The reconstructed track would interfere with the movements of Blanding's turtles between wetland and upland (potential breeding) habitats on either side of the right-of-way for a total distance of 0.72 mile from Purchase to Prospect Street, 0.87 mile from Prospect to Foundry Street, and 0.28 mile from Foundry Street to the start of the trestle, for a total of 1.9 miles of barrier effect. South of this point, the track would be on an elevated trestle and would not impede turtle movements. The installation of between-the-ties crossing structures and other mitigation measures in concert with potential time of year construction limitations would aid in minimizing impacts to this species.

Construction of the trestle would result in the loss of natural vegetation adjacent to vernal pools, which has the potential to affect water temperature and detrital influxes. However, the loss of canopy would be restricted to one side of each vernal pool and would not affect the capacity of the pool to continue to provide habitat for Blanding's turtles. There would be a total loss of upland vegetation of 12.5 acres consisting of successional vegetation within the right-of-way.

Eastern Box Turtle (*Terrapene carolina carolina*)—The principal effect of the Stoughton Alternative to eastern box turtles would be to impede the movement of turtles from east to west, particularly in the area where undeveloped forested land abuts the right-of-way on both sides. The reconstruction of existing freight rail tracks is not anticipated to affect turtle movement. There would be a loss of 11.4 acres of successional upland vegetation potentially utilized by eastern box turtles as well as the unvegetated gravel railroad berm. The Stoughton Alternative would require that the tracks be reconstructed in the section of the Hockomock Swamp (south of the former Raynham Greyhound Track) that provides eastern box turtle habitat. This work would result in a "take" as the tracks would preclude

the movement of eastern box turtles across the right-of-way, between suitable habitat areas, for a distance of 0.9 mile.

Indirect Impacts of the Stoughton Electric Alternative: Stoughton Rail Segment

The Stoughton Line is an inactive line without tracks and ties for most of its length. Existing culverts carry streams beneath the railroad embankment and provide migratory habitat to wildlife species. In addition to the culverts, the right-of-way itself provides suitable migratory habitat for rare species because there are no tracks and ties to prevent turtles and amphibians from moving across the right-of-way. The right-of-way does not likely provide significant nesting, breeding, and foraging habitat for rare species. However, as noted by the NHESP, much of the embankment has become reforested since the tracks were removed, and is likely to provide suitable feeding, sheltering, and overwintering habitat for the blue-spotted salamander and eastern box turtle. The GIS analysis did not show any loss of Atlantic white cedar swamp habitat; however, Atlantic white cedars were observed growing on the edges of the rail bed and may provide habitat for Hessel's hairstreak.

Documented nesting of spotted turtles within the right-of-way of the Stoughton segment indicates that portions of the right-of-way may also provide nesting habitat for the Blanding's turtle and eastern box turtle. However, nesting habitat available within or adjacent to the right-of-way is of marginal quality, except for the area beneath the overhead powerlines south of Foundry Street. These areas would be limited to portions of the right-of-way where the canopy is open enough to allow sunlight to incubate the eggs for long enough periods of time for viable survival, but higher-quality nesting habitat is present along the powerline right-of-way. Turtles moving between patches of suitable habitat may also cross the right-of-way. Table 4.15-9 lists the species reported to be found within Priority Habitat polygons and the potential habitat functions that could be impacted.

Table 4.15-9 Whittenton Alterntive Impacts within Estimated and Priority Habitat

Location/Species	Upland Habitat Loss (ac)	Wetland (ID)	Wetland Loss (sf)	Temporary Construction Impact (sf)	Comments
Whittenton Alternative- (PH261)					
Blanding's turtle (*Emydoidea blandingii*)	12.5	EA-77	0	217	Forested and shrub wetland bordering intermittent stream CVP 1665
Blue-spotted salamander (*Ambystoma laterale*)	7.5	EA-77	0	217	Forested and shrub wetland bordering intermittent stream CVP 1665
Eastern box turtle (*Terrapene carolina carolina*)	12.6	NA	NA	NA	Successional upland vegetation, unvegetated gravel railroad berm, impede movement

1 Not applicable, no loss of suitable habitat.

The reconstructed rail infrastructure, in locations where no tracks or ties currently exist, would prevent or impede the movement of Blanding's or eastern box turtles across the right-of-way. This habitat

fragmentation could lead to the loss of genetic diversity and decrease in population size, potentially resulting in the local extirpation of some small populations.[49] Fragmentation of habitat for blue-spotted salamanders could potentially have similar results, although the rail would constitute a barrier to salamander movement at the northern edge of the Hockomock Swamp population area and would not impede movement of salamanders for the remaining 7,000 linear feet of the trestle. No habitat fragmentation is anticipated for state-listed insect species which primarily occur along the active freight rail lines. The trestle would be constructed between south of Foundry Street and north of Raynham Park station site. Additional description of the trestle is included in Section 4.15.3.6.

Indirect impacts to rare species associated with the Stoughton segment of the Stoughton Electric Alternative include:

- Loss of migratory routes (barrier effect) and increase in habitat fragmentation, because construction of this track would occur within undeveloped forested area. Within the Hockomock Swamp (PH1392/EH59), in areas north and south of the trestle, the total barrier effect would be approximately 3.2 miles. The barrier effect would be approximately 1.9 miles potentially used by Blanding's turtle between Depot Street and Foundry Street, approximately 0.4 mile used by blue-spotted salamander between Foundry Street and the northern limit of the trestle, and approximately 0.9 mile used by eastern box turtle between the southern limit of the trestle and Bridge Street. The barrier effect was estimated by calculating the length of the new track through the polygons of Priority and Estimated Habitat. This is a conservative estimate of impact because it is unlikely that the entire length of the proposed new track would cross habitat suitable for migration. It does not account for the construction of culverts or bridges as part of the design that would improve the potential for wildlife passage and reduce fragmentation impacts.

- There is potentially some fragmentation to Hessel's hairstreak habitat caused by widening the canopy gap within the Hockomock Swamp. Maintenance of the powerline corridor along the right-of-way has created an existing canopy gap within the Pine Swamp.

- Increase in turtle mortality from being struck by trains if they are able to climb the rail, but this is unlikely to occur frequently because the steel rails represent a physical barrier not easily climbed by turtles.

- At grade crossings, when moving between habitats, turtles could also die of dehydration if they are trapped between the rails and are not able to get out.

- Clearing within 100 feet of vernal pools could lead to the loss of shade within vernal pool habitat that could be used by the blue-spotted salamander. The vernal pool impacts are evaluated in Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*.

Stoughton Diesel Alternative

No traction power facilities are proposed under the diesel alternative. Therefore, the Stoughton Diesel Alternative, north of Weir Junction, would have approximately 1.9 acres less impact than the Stoughton Electric Alternative. All other rare species impacts are the same as those associated with the Stoughton Electric Alternative.

[49] Steen, D.A. and J.P. Gibbs. 2004. Effects of roads on the structure of freshwater turtle populations. Cons. Biol. 18:1143-1148.

Whittenton Electric Alternative

The Whittenton Electric Alternative is an alignment variant of the Stoughton Electric Alternative. Specifically, at Raynham Junction near the southern end of the right-of-way of the former Stoughton Line, the alignment would divert to the southwest, following the right-of-way of the former Whittenton Branch. This alignment would connect with the existing Attleboro Secondary tracks at Whittenton Junction in Taunton, and then continue toward the southeast to connect with the tracks of the New Bedford Main Line at Weir Junction. The portion of the former Stoughton Line between Raynham Junction and Weir Junction would not be used under the Whittenton Alternative which would avoid crossing the Priority and Estimated Habitat (PH1297/EH11077) associated with Pine Swamp.

One existing train stations along the Stoughton Line would be reconstructed (Canton Center) and six new train stations would be constructed (Stoughton, Easton Village, North Easton, Raynham Park, Taunton Depot, and Dana Street). Four traction power stations would be built along this track segment. No new layover facilities would be constructed along this segment. Potential impacts to rare species from reconstructing the existing and developing the new stations are discussed later in this chapter.

Based on the 2008 NHESP Atlas, the Whittenton Electric Alternative crosses two Priority and Estimated Habitats (PH1392/EH59, and PH261/EH153). These Priority Habitats include land within the Hockomock Swamp ACEC and the Three Mile River ACEC (Figure 4.15-16-17). The following sections describe both direct and indirect impacts as they relate to the Whittenton Alternative; inclusive of the Southern Triangle components.

Direct Impacts of the Whittenton Electric Alternative: Stoughton/Whittenton Rail Segment

The alignment of the proposed Whittenton Alternative follows previously developed railroad corridors along the Attleboro Secondary, Whittenton Branch, and Stoughton Line. Minor temporary and permanent impacts may occur within narrow strips immediately adjacent to the right-of-way during track reconstruction and re-alignment. Most of the impacts are expected along the track construction on out-of-service or abandoned rights-of-way between Stoughton Station and Raynham Junction (Stoughton Line) discussed above, and from to Raynham Junction to Whittenton Junction (Whittenton Branch). Impacts to rare species habitat are not expected along the Attleboro Secondary because it is an existing active rail line and already presents a barrier to wildlife movement.

Along the Whittenton Branch, while the right-of-way road does not constitute wildlife habitat, constructing the railroad would result in additional impacts on either side of the right-of-way. More substantial impacts would occur along the southernmost section of the right-of-way between the access road and Whittenton Junction, where the path is narrower. Area of impact was estimated by measuring the area inside the limit of work (limit of grading) and subtracting the area of the roadway and path, based on available survey information. A total of approximately 1.2 acres of rare species habitat (successional vegetation along the edge of the traveled path) would be permanently impacted as a result of constructing the railroad. All impacted habitat is upland area except for approximately 460 square feet of permanent impact and 820 square feet of temporary impact to Wetland RWB-04.

Portions of the Whittenton Electric Alternative along the Stoughton Line, would potentially impact rare species habitat within the Hockomock Swamp ACEC, which encompasses most of Priority and Estimated Habitat polygon (PH1392/EH59). Habitat potentially used by Blanding's turtle, eastern box turtle, blue spotted salamander, gypsywort and Hessel's hairstreak would be impacted within the Hockomock Swamp ACEC. An additional 11 state-listed species occur within the Hockomock Swamp polygon

(PH1392/EH59). Other rare species and their habitat may occur within the polygons or within the contiguous ACECs.

Mitigation for the barrier effect would likely be provided by:

- Reconstructing culverts to meet Commonwealth of Massachusetts Stream Crossing Standards[50]
- Installing between-the-ties crossing structures
- Installing wildlife crossing culvert

Indirect Impacts of the Whittenton Electric Alternative: Stoughton/Whittenton Rail Segment

The Whittenton Branch and the section of the Stoughton Line from Stoughton Station to Raynham Junction are inactive lines without tracks and ties for most of their lengths. Existing culverts carry streams beneath the abandoned railroad embankment and provide migratory habitat to wildlife species. In addition to the culverts, the right-of-way of the abandoned rail line itself provides suitable migratory habitat for rare species because there are no tracks and ties to prevent turtles and amphibians from moving across the right-of-way.

The right-of-way does not likely provide suitable nesting, breeding, and foraging habitat for rare species. However, as noted by the NHESP, much of the embankment has become reforested since the tracks were removed, and is likely to provide suitable feeding, sheltering, and overwintering habitat for blue-spotted salamanders and eastern box turtles. The GIS analysis did not show the loss of Atlantic white cedar swamp habitat; however, Atlantic white cedars were observed growing on the edges of the rail bed and may provide habitat for Hessel's hairstreak.

Documented nesting of spotted turtles within the abandoned rail line right-of-way indicates that portions of the right-of-way may also provide nesting habitat for Blanding's turtles and eastern box turtles, except for the area beneath the overhead powerlines south of Foundry Street. Nesting habitat of marginal quality is available within or adjacent to the rail right-of-way where the tree canopy is open enough for sunlight to incubate turtle eggs long enough for viable survival. Higher quality nesting habitat is present along the powerline right-of-way.

The reconstructed rail infrastructure, in locations where no tracks or ties currently exist, would prevent or impede the movement of Blanding's or eastern box turtles across the right-of-way. This habitat fragmentation could lead to the loss of genetic diversity and decrease in population size, potentially resulting in the local extirpation of some small populations.[51] Fragmentation of habitat for blue-spotted salamanders could potentially have similar results, although the rail would constitute a barrier to salamander movement for only 1,500 linear feet at the northern edge of the Hockomock Swamp population area and would not impede movement of salamanders for the remaining 7,000 linear feet of the trestle. No habitat fragmentation is anticipated for state-listed insect species which primarily occur along the active freight rail lines. Unlike the Stoughton Alternative, which crosses Pine Swamp between Raynham Junction and Weir Junction, the Whittenton Alternative would not utilize this segment and

[50] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

[51] Steen, D.A. and J.P. Gibbs. 2004. Effects of roads on the structure of freshwater turtle populations. Cons. Biol. 18:1143-1148.

thus would avoid potential impacts to Hessel's hairstreak found within the Pine Swamp (PH1297/EH1077).

The indirect impacts to rare species associated with this alternative are the same as the ones described for the Stoughton Alternative, except that:

Loss of migratory routes (barrier effect) and increase in habitat fragmentation, because constructing of this track would be within undeveloped forested area. Within the Hockomock Swamp (PH1392/EH59), in areas north and south of the trestle, the total barrier effect would be approximately 3.6 miles. The barrier effect would be approximately 1.9 miles for Blanding's turtle between Depot Street and Foundry Street, approximately 0.4 mile for blue-spotted salamander between Foundry Street and the northern limit of the trestle, and approximately 0.9 mile for eastern box turtle between the southern limit of the trestle and Bridge Street. Within the Whittenton Branch (PH261/EH153) there is approximately 0.4 mile of additional barrier effect for the eastern box turtle. The barrier effect was estimated by calculating the length of the new track through the Priority and Estimated Habitat polygon. This is a conservative estimate of impact because it is unlikely that the entire length of the proposed new track would cross habitat suitable for migration. It does not account for the construction of culverts bridges or between-the-tie-crossings as part of the design that would improve the potential for wildlife passage and reduce fragmentation impacts.

Whittenton Diesel Alternative

No traction power facilities are proposed under the Whittenton Diesel Alternative. Therefore, the Whittenton Diesel Alternative, north of Weir Junction, involves approximately 1.9 acres less impact than the Whittenton Electric Alternative, which includes 0.8 acre of upland forest and 0.3 acre of upland shrub scrub within traction power station TPSS-1. All other rare species impacts are the same for the Whittenton Diesel Alternative as those associated with the Whittenton Electric Alternative.

Stations

This section describes the Priority and Estimated Habitats within the proposed station sites. None of the proposed station sites for any of the Build Alternatives are within mapped Priority Habitat. All the station sites are within partially or fully developed areas. Raynham Park is the only station where the platform would be within mapped Priority Habitat (PH1392); the rest of the station site and its parking lot would not be within the Priority Habitat polygon. The Raynham Park station would serve the Stoughton Alternatives (electric and diesel) and the Whittenton Alternatives (electric and diesel) (Figure 4.15-4-17). The Raynham Park station site does not provide potential habitat because it is mostly developed. Based on the habitat requirements of the species known to occur in the study area, it is unlikely that any of the identified rare species would be found on any of the station sites, except for the eastern box turtle.

Layover Facilities

Two preferred overnight layover facilities have been selected on the New Bedford Main Line and Fall River Secondary. Neither of the proposed layover facilities are located within Priority or Estimated Habitat polygons.

One midday rail layover facility is planned for the Boston area. This site is associated with the proposed expansion of South Station, which has independent utility of the South Coast Rail project and is not part of the South Coast Rail project. Any impacts associated with the expansion of South Station, including

midday layover facilities, would be addressed through the environmental review process associated with the proposed expansion of South Station. The proposed expansion of South Station is discussed in Chapter 3 as part of the No-Build Alternative.

4.15.3.4 Temporary Construction-Period Impacts

This section describes the range of potential temporary construction impacts to rare species caused by the construction of the South Coast Rail alternatives. It also describes a range of potential mitigation measures.

Temporary Impacts

Temporary impacts include short-term disturbances to rare species during construction that would cease once construction activities are complete. This may include, but is not limited to, the installation of erosion controls, the establishment of a work area, or the installation of a temporary structure at a stream crossing.

Potential short-term construction related impacts may include impairment of ground and surface water due to sedimentation in stormwater runoff or accidental spills; temporary loss of habitat, displacement of rare species due to physical disturbance and noise; and plant and animal injury or death from construction equipment and activities. In areas where the project would require construction in a wetland (resulting in the loss of wetland), the impact calculations include an area of temporary wetland impact extending 8 feet from the slope or retaining wall limit, to allow construction of footings or slope supports. These areas would be restored and revegetated following construction, with appropriate hydrology and plant species. This would result in a short-term loss of habitat available for state-listed species such as water-willow stem borer moth, pale green pinion moth, or coastal swamp amphipod.

Potential short-term construction related impacts may include impairment of ground and surface water due to sedimentation in stormwater runoff or accidental spills; temporary loss of habitat, displacement of rare species due to physical disturbance and noise; and plant and animal injury or death from construction equipment and activities.

The Stoughton Alternative would require reconstructing freight rail bridges across the Taunton River (within the New Bedford Main Line), potentially with temporary impacts to Atlantic sturgeon habitat. The National Marine Fisheries Service has noted that it is unlikely that this species occurs in the vicinity of the proposed project (see correspondence in Appendix 4.15-A).

Both the Stoughton and Whittenton Alternatives propose constructing a trestle along the Hockomock Swamp to avoid impacts to rare species and other wildlife. Constructing the trestle would require placement of hay bales and installing erosion controls along the limit of work which would result in a temporary barrier to rare salamanders and turtle species which currently use the abandoned right-of-way for migration. However, this barrier would only be a short-term temporary condition.

Mitigation for Construction-Period Impacts

Timing of construction may affect the extent of impacts to rare species. Disturbance of habitat during the breeding season is likely to have greater short-term or individual effects on reproductive success; however short-term effects are not likely to have long-term repercussions unless the species population is already unstable. To avoid potential short-term effects to breeding wildlife and rare species (e.g., turtles and salamanders) construction in areas where movement of rare species is a concern, including

the Hockomock Swamp, and Pine Swamp sections may be phased to reduce disruption during breeding season. Daily monitoring of the work areas by a qualified biologist/technician, on both sides of the fencing, would be conducted from early Spring through late Fall. In all cases, construction would be limited to normal daylight hours.

Construction impacts to rare species using or living within aquatic resources (e.g., mocha emerald, coastal swamp amphipod, and pale green pinion moth) would be mitigated through the appropriate use of erosion and sedimentation controls to minimize and eliminate sedimentation of wetlands and waterways. Erosion and sedimentation controls would be installed before construction begins, properly maintained through the construction period, and removed after disturbed areas have stabilized. Construction of bridges and culverts at stream crossings would follow Best Management Practices to avoid impacts to streams and rare species using them.

Detailed site-specific, species-specific mitigation measures would be developed in the permit process in consultation with NHESP. Some of the mitigation measures would include:

- Staking, entrenching siltation fencing at all limits of work within identified rare species habitat areas
- One-way turtle gates
- Daily monitoring of the work area by a qualified biologist/technician, on both sides of the fencing, from early Spring through late Fall; more specifically monitoring would be conducted in areas of rare species habitat as required by NHESP in the Conservation Management Plan (CMP)
- Removing any animals found within the work area
- Relocating any animals found along the drift fence (outside of the work area) to the opposite side of the corridor

Timing and Methods of Construction

Timing of construction may affect the extent of impacts to rare species. Disturbance of habitat during the breeding season is likely to have greater short term or individual effects on reproductive success; however short term effects are not likely to have long term repercussions unless the species population is already unstable. To avoid potential short term effects to breeding wildlife and rare species (e.g., turtles and salamanders), construction in areas where movement of rare species is a concern, including the Hockomock Swamp and Pine Swamp sections, may be phased to reduce disruption during breeding season. In all cases, construction would be limited to normal daylight hours.

Construction impacts to aquatic resources and associated rare species would be avoided and minimized by the appropriate use of erosion and sedimentation controls. These would be installed before construction begins, properly maintained, and removed after disturbed areas have stabilized.

To protect animals (primarily Blanding's turtle and eastern box turtle) during the construction process, the applicant would provide construction period protection and monitoring in all areas where work is proposed within mapped estimated habitat. Construction period monitoring would include:

- Inspecting siltation fencing at all limits of work within identified rare species habitat areas
- Inspecting the one way turtle gates
- Daily monitoring of the work area between Depot Street in Easton and Bridge Street in Raynham by a qualified biologist/technician, on both sides of the fencing, from early Spring through late Fall
- Removal/Relocating any animals found within the work area
- Relocating any animals found along the drift fence (outside of the work area) to the opposite side of the corridor

Post-construction Maintenance

Right-of-way maintenance is critical to the protection of the tracks and ties and to maintaining railroad safety. Right-of-way maintenance is done in accordance with an approved Vegetation Management Plan (VMP) and Yearly Operating Plan (YOP). To protect state-listed species along the project corridors, the applicant adheres to the approved VMP, as implemented with its YOPs, which restrict the use of herbicides in areas adjacent to wetlands or sensitive resources. Sensitive areas include wetlands within 10 feet of surface waters or wetlands where there is no herbicide use application, and include the entire Hockomock Swamp and Pine Swamp sections. Water resources and proposed stormwater management are described separately in the FEIS in Chapter 4.17, *Water Resources*.

4.15.3.5 Summary of Impacts by Alternative

A total of eight state-listed rare species have been recorded in areas adjacent to the project corridors. These include one salamander, two turtles, one crustacean, three moths and butterflies, and one dragonfly. Potential impacts to these species include habitat loss (primarily associated with filling wetlands) and habitat fragmentation, primarily due to constructing new track in areas that do not currently have track, out-of-service portions of the Stoughton Line, and Whittenton Branch. A detailed table of impacts for each of the alternatives is presented below.

No-Build (Enhanced Bus) Alternative

None of the proposed park-and-ride facilities are within Estimated and Priority Habitats. Therefore, none of the components of the No-Build Alternative are expected to impact rare species and/or their habitat.

Southern Triangle

The Southern Triangle portion of the project area includes the existing active Fall River Secondary and the New Bedford Main Line and is common to both railway alternatives (Stoughton and Whittenton). A detailed table of impacts for each of the alternatives is presented below and includes the Southern Triangle.

Stoughton Electric Alternative

The Stoughton Electric Alternative would adversely affect habitat of eight state-listed species (blue-spotted salamander, Blanding’s turtle, eastern box turtle, coastal swamp amphipod, mocha emerald dragonfly, Hessel’s hairstreak, pale green pinion moth, and water-willow stem borer), and result in a loss

of upland and wetland habitat loss of eight state-listed species (Table 4.15-10). Most of the impacts are expected along the track construction on out-of-service and abandoned portions of the Stoughton Line right-of-way between Stoughton Station and Dean Street. It is anticipated that within the Hockomock Swamp (PH1392/EH59), in areas north and south of the trestle, the Stoughton Line would interrupt migratory corridors for rare species. North of the trestle, the barrier effect would be approximately 1.9 miles and 0.4 mile within areas used by Blanding's turtle and blue-spotted salamander respectively; south of the trestle, the barrier effect would be approximately 0.9 mile within areas used by eastern box turtle (Table 4.15-10).

Table 4.15-10 Impacts by Species–Stoughton Electric Alternative

Species	Upland Habitat Loss (ac)	Wetland Habitat Loss (sf)	Wetland Temporary (sf)	Barrier Effect (length in miles)
Blanding's turtle (*Emydoidea blandingii*)	12.5	0	217	1.9
Blue Spotted salamander (*Ambystoma laterale*)	7.5	0	217	0.4
Hessel's hairstreak[2] *(Callophrys hesseli)*	NA[1]	18,578[4]	14,537	NA
Mocha emerald (*Somatochlora linearis*)	NA	9,474	6,406	NA
Coastal swamp amphipod (*Synurella chamberlaini*)	NA	11,691	9,758	NA
Water-willow stem borer moth (*Papaipema sulphurata*)	NA	11,691	9,758	NA
Pale green pinion moth (*Lithophane viridipalle*)	NA	11,691	9,758	NA
Gypsywort (*Lycopus rubellus*)	NA	NA	NA	NA
Long-leaved panic-grass (*Panicum rigidulum* ssp. *pubes cens*)	NA	NA	NA	NA
Eastern box turtle (*Terrapene carolina carolina*)	12.6[3]	NA	NA	0.9

1 Not applicable, no loss of suitable habitat.
2 Loss of 35 Atlantic white cedar trees.
3 Calculated by NHESP, including vegetated and unvegetated area.
4 Assumes all altered wetland contains suitable host species.

Raynham Park is the only station where part of the station (the platform) would be within mapped Priority Habitat (PH1392); the remainder of the station and its parking lot are outside of the Priority Habitat polygon. The platform impacts are within the limits of work of the Stoughton Line and are accounted for in the impacts associated with reconstruction of the track. The Raynham Park station site does not provide potential habitat because it is currently developed. None of the other station sites are within mapped Priority and Estimated Habitat.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative would result in approximately 1.9 acres less impact than the electric alternative because no traction power facilities are proposed under the diesel alternative. All other rare

species impacts would be the same as those associated with the Stoughton Electric Alternative. These impacts include habitat loss for eight state-species and associated habitat fragmentation/barrier effect for three of these species (blue-spotted salamander, Blanding's turtle, and eastern box turtle).

Whittenton Electric Alternative

The Whittenton Electric Alternative would adversely affect habitat of eight state-listed species (blue-spotted salamander, Blanding's turtle, eastern box turtle, coastal swamp amphipod, mocha emerald dragonfly, Hessel's hairstreak, pale green pinion moth, and water-willow stem borer), and result in a loss of upland and wetland habitat loss of eight state-listed species (Table 4.15-11). Most of the impacts are expected along the track construction on out-of-service and abandoned portions of the Stoughton Line right-of-way between Stoughton Station and Dean Street. It is anticipated that within the Hockomock Swamp (PH1392/EH59), in areas north and south of the trestle, the Stoughton Line would interrupt migratory corridors for rare species. North of the trestle, the barrier effect would be approximately 1.9 miles and 0.4 mile within areas used by Blanding's turtle and blue-spotted salamander respectively; south of the trestle, the barrier effect would be approximately 1.3 miles within areas used by eastern box turtle (Table 4.15-11).

Most of the impacts are expected along the track construction on out-of-service and abandoned rights-of-way between Whittenton Junction and Raynham Junction (Whittenton Branch), and between Dean Street and Stoughton Station from Raynham Junction (portion of the Stoughton Line). It is anticipated that within the Hockomock Swamp (PH1392/EH59) and Whittenton Branch (PH261/EH153) the right-of-way would interrupt migratory corridors (3.6 miles of barrier effect) for rare species. North of the trestle, the barrier effect would be approximately 1.9 miles within areas used by Blanding's turtle and 0.4 mile within areas used by blue-spotted salamander. South of the trestle, the barrier effect 1.3 miles of additional barrier effect within areas used by eastern box turtle within the Whittenton Branch (Table 4.15-11).

Raynham Park is the only station where part of the station (the platform) would be within mapped Priority Habitat (PH1392); the remainder of the station and its parking lot are outside of the Priority Habitat polygon. The platform impacts are within the limits of work of the Stoughton Line and are accounted for in the impacts associated with reconstruction of the track. The Raynham Park station site does not provide potential habitat because it is currently developed. None of the other station sites are within mapped Priority and Estimated Habitat.

Table 4.15-11 Impacts by Species–Whittenton Electric Alternative

Species	Upland Habitat Loss (ac)	Wetland Habitat Loss (sf)	Wetland Temporary (sf)	Barrier Effect (length in miles)
Blanding's turtle (*Emydoidea blandingii*)	12.5	0	217	1.9
Blue Spotted salamander (*Ambystoma laterale*)	7.5	0	217	0.4
Hessel's hairstreak *(Callophrys hesseli)*	NA[1]	18,578	14,537	NA
Mocha emerald (*Somatochlora linearis*)	NA	9,474	6,406	NA
Coastal swamp amphipod (*Synurella chamberlaini*)	NA	11,691	9,758	NA
Water-willow stem borer moth (*Papaipema sulphurata*)	NA	11,691	9,758	NA
Pale green pinion moth (*Lithophane viridipalle*)	NA	11,691	9,758	NA
Gypsywort (Lycopus rubellus)	NA	NA	NA	NA
Long-leaved panic-grass (*Panicum rigidulum* ssp. *pubescens*)	NA	NA	NA	NA
Eastern box turtle (*Terrapene carolina carolina*)	13.8[2]	NA	NA	1.3[3]

1 Not applicable, no loss of suitable aquatic habitat
2 Calculated by NHESP, including vegetated and unvegetated area
3 Barrier effect equals 0.9 mile along north of Raynham Junction and 0.4 mile along the southern portion of the Whittenton Branch.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative would result in approximately 1.9 acres less impact than the electric alternative because no traction power facilities are proposed under the diesel alternative. All other rare species impacts would be the same as those associated with the Whittenton Electric Alternative. These impacts include habitat loss for eight state-species and associated habitat fragmentation/barrier effect for three of these species (blue-spotted salamander, Blanding's turtle, and eastern box turtle).

Summary of Impacts

Each of the Build Alternatives could impact eight state-listed species, and would result in the loss of migratory route habitat because all Build Alternatives require construction of new rail lines where currently there are none (Table 4.15-12).

The Stoughton and Whittenton Alternatives would have potential impacts on suitable rare species habitat as seen in Table 4.15-10 and 4.15-11 for the diesel alternatives, respectively. The Stoughton and Whittenton Diesel Alternatives would each result in approximately 1.9 acres less impact than the electric alternative because no traction power facilities are proposed under the diesel alternative.

Long-leaved panic-grass is known to occur within the polygon that includes a wooded swamp area and the Cedar Swamp River (PH1158). The long leaved panic grass is associated with coastal plain pond shore communities, and occurs in moist open sandy habitats on the coastal plain. No suitable habitat has been identified in proximity to the rail right-of-way.

Table 4.15-12 Direct and Indirect Effects to Rare Species from the South Coast Rail Alternatives

	# of Priority Habitat (PH)	# of Rare Species Impacted[2]	Migratory Route (Barrier effect)
Stoughton Electric	5	8	3.2 miles
Stoughton Diesel	5	8	3.2 miles
Whittenton Electric	6	8	3.6 miles
Whittenton Diesel	6	8	3.6 miles
Stations	0	--	--
Layovers	0	--	--

The Stoughton and Whittenton Alternatives would result in the loss of migratory route habitat (barrier effect) of approximately 3.2 miles, and 3.6 miles, respectively.

4.15.3.6 Mitigation

This section describes the measures to avoid and minimize impacts to rare species and their habitat. It includes specific description of mitigation measures for each of the proposed alternatives.

Introduction

Measures to be developed in coordination with applicable regulatory agencies to avoid and minimize and mitigate rare species impacts within the project study area could include the following.

- Construct tunnels or other passages to facilitate movement across the railbed, with drift fencing.
- Construct a trestle within a section of the Hockomock Swamp as part of the Stoughton and Whittenton Alternatives.
- Construct new nesting or reproduction sites (e.g., for eastern box turtles).
- Supplement vegetation, particularly Atlantic white cedar populations.
- Conduct pre-construction studies to determine population size, distribution, or usage of the railbed to finalize mitigation measures.
- Develop protocols for protection of rare species during the construction process.
- Develop, in consultation with NHESP, mitigation measures that would be acceptable to provide a “net benefit to the local population” of each affected species. These measures may include:
    - Establish new habitat areas based on the state of the science
    - Acquisition of land or conservation restrictions that protect identified critical habitats that are at risk of loss or degradation

- Contribute to the mitigation bank for land protection of species such as the eastern box turtle

Avoidance

Habitat used by state-listed species is present in wetlands and uplands within the study area. Due to the close proximity of state-listed species habitat to the right-of-way, there are no feasible or practicable alternatives that would entirely avoid the loss of habitat. Avoidance of all impacts to rare species habitat would only be possible by implementing the No-Build Alternative (Enhanced Bus). The Build Alternatives would avoid impacts to rare species by:

- Locating all station sites and layover facilities outside of Priority Habitat, and not constructing maintenance roads along the project corridors.
- Keeping, when possible, the track construction and improvements within the existing footprint.
- Constructing a 8,500 foot trestle elevated through the Hockomock Swamp, from approximately 1,400 feet south of Foundry Street in Easton (near the SE Regional Vocational High School ball field) to approximately 1,400 feet north of the proposed Raynham Park station site (Figure 4.15-18). The trestle would be constructed using precast concrete beams, supported on concrete piles with a concrete pile cap. The span between piles would be approximately 30 feet, and the distance between the existing ground and the bottom of the beams would be 5 feet. At each end, the height of the trestle above the ground would decrease to approximately 2 feet above existing grade. To complete the return to ground level, approximately 900 feet of elevated track would be built between retaining walls at each end.
- The Whittenton Alternative would avoid all impacts to rare species habitat (i.e., Hessel's hairstreak) within Pine Swamp by following the Whittenton Branch, rather than the Stoughton Line south of Raynham Junction. However, this would increase impacts to eastern box turtle habitat.

The two proposed traction power substations (Easton and New Bedford) cannot be sited to avoid impact to state-listed species habitat. The only avoidance alternative would be the Stoughton Diesel Alternative. Traction power substations must be located in proximity to major power lines:

- Major power lines cross the New Bedford Main Line south of Samuel Barnett Boulevard. The presence of the powerlines dictates the location of the power substation, and there are no upland locations proximate to the proposed power substation that are not within mapped eastern box turtle habitat. The substation has been designed to avoid impacts to wetland habitats which may provide habitat to listed invertebrate species.
- A major power line crosses the Stoughton Line in the Hockomock Swamp, approximately 1.3 miles south of Foundry Street. The entire area both south and north of the power line is within mapped habitat for blue-spotted salamander and Blanding's turtle. Several alternative locations for this substation were evaluated prior to the publication of the DEIS/DEIR. Upland locations on the west side of the right-of-way were eliminated from further consideration as this land is Town of Easton Conservation Land, protected under

Article 97. In addition, any power substation on the west side would require constructing an access road parallel to the right-of-way, which would have increased impacts on rare species habitat and migration. Two alternative locations on the east side of the right-of-way, within land owned by the Southeast Regional Vocational-Technical School, were evaluated. Both locations are proximate to the right-of-way but within the school's athletic fields. These fields are used by the school athletic programs and by other Easton intermural sports programs. The applicant believes that it is not practicable to eliminate these youth athletic programs.

Minimization

Where construction and rehabilitation of a rail system would occur within or adjacent to rare species habitat, all practicable measures have been taken to minimize adverse impacts. The design refinement process that each of the proposed alternatives and associated stations have undergone since the ENF[52] was published has sequentially reduced impacts to rare species habitat. Measures to minimize impacts would continue through final design, including coordination with the regulatory agencies.

Some of the impact minimization efforts common to all alternatives include:

- Reducing the amount of rare species habitat loss by minimizing the width of work area within sections of the Fall River Secondary and most of the New Bedford Main Line by using single track instead of double track.
- Reducing the amount of rare species habitat loss by not constructing maintenance roads along the rail corridors.
- Replacing and enhancing structurally deficient culverts within the project corridor to allow movement through existing culverts to continue. Design measures would be identified to maintain existing hydrology between wetland systems.
- Further minimization efforts would be pursued during subsequent design phases, for example by using steeper slopes and reducing fill, or retaining walls.

Timing and Methods of Construction

Timing of construction affect the extent of impacts to rare species. Disturbance of habitat during the breeding season is likely to have greater short-term or individual effects on reproductive success; however short-term effects are not likely to have long-term repercussions unless the species population is already unstable. To avoid potential short-term effects to breeding wildlife and rare species (e.g., turtles and salamanders), construction in areas where movement of rare species is a concern, including Hockomock Swamp, and Pine Swamp sections may be phased to reduce disruption during breeding season. In all cases, construction would be limited to normal daylight hours.

Construction impacts to aquatic resources and associated rare species would be avoided and minimized by the appropriate use of erosion and sedimentation controls to minimize and eliminate sedimentation of wetlands and waterways. Erosion and sedimentation controls would be installed before construction begins, properly maintained, and removed after disturbed areas have stabilized. To protect animals during the construction process, the Applicant has indicated that it would provide construction period

[52] Executive Office of Transportation and Public Works, South Coast Rail Environmental Notification Form, November 2008.

protection and monitoring in all areas where work is proposed within mapped estimated habitat. Construction period monitoring would include:

- Staked, entrenched siltation fencing at all limits of work within identified rare species habitat areas
- Inspecting siltation fencing at all limits of work within identified rare species habitat areas
- Inspecting one-way turtle gates which would prevent animals that get onto roadways from being trapped between fences on both sides of the road
- Daily monitoring of the work area by a qualified biologist/technician, on both sides of the fencing, from early Spring through late Fall; more specifically monitoring would be conducted in areas of rare species habitat as required by NHESP in the CMP
- Removing any animals found within the work area
- Relocating any animals found along the drift fence (outside of the work area) to the opposite side of the corridor

Stoughton Alternative (Electric and Diesel)

The Stoughton Alternatives include a trestle through the Hockomock Swamp which would minimize loss of rare species habitat and barrier effects that would prevent turtle and salamander species from crossing the tracks. Wildlife passages (under-rail troughs) in the Pine Swamp may be considered as a mitigation measure.

Whittenton Alternative (Electric and Diesel)

As with the Stoughton Alternatives, the Whittenton Alternatives would minimize loss of rare species habitat and barrier effects by constructing the trestle through the Hockomock Swamp. In addition, this alternative would use wildlife passages along the Whittenton Branch to minimize impacts to the migration of eastern box turtles.

Specific Mitigation Measures

This section describes general mitigation measures common to all alternatives and mitigation measures specific for each of the proposed alternatives. It should be noted, however, that the mitigation measures described herein have been proposed by the applicant/proponents as conceptual mitigation options, and have not been officially endorsed by the USACE. Mitigation options could include, but are not limited to, those described here and could and may become part of a permitted project in the event that a permit is issued.

Common to All

Some of the general mitigation measures common to all alternatives would include:

- Constructing wildlife corridors/passages (e.g., enhanced stream culverts/oversized culverts, bridges, between tie crossings and under-rail troughs)
- Timing and methods of construction

- Post-construction maintenance
- Enhancing or replacing habitat by off-site habitat protection and preservation
- Funding research programs to benefit state-listed species

Provide Wildlife Corridors

Wildlife crossings are specially-designed culverts intended to allow small vertebrates to safely pass under the railroad. These have been conceptually designed in accordance to guidelines based on each species requirements. For example some culverts include skylights to allow natural light to illuminate the culvert; a natural substrate on the bottom of the culvert; and extended drift-fence wing walls to direct animals to the crossings. NHESP suggests that as the project design advances, site-specific information (topographic profile, elevation of track, groundwater) and conceptual designs at each recommended location should be developed and a variety of types of mitigation measures should be incorporated.

Chapter 4.14, *Biodiversity*, *Wildlife, and Vegetation*, provides an analysis of wildlife crossings and types of culverts and crossing structures evaluated as well as impacts to vernal pool habitat, general wildlife. Impacts to state-owned open space are addressed in Chapter 4.10, *Open Space*. Some of the proposed wildlife corridors include underpasses such as enhanced stream culverts, bridges and tunnels. Enhanced/oversized stream culverts are relatively simple concrete box culverts that pass underneath the ballast of the rail line. If there are no structural constraints, existing 5-foot culverts may be replaced with 8-foot wide culverts to provide additional wildlife crossing opportunities. Such enhanced culverts can be embedded to provide natural substrate within the culvert and to maintain hydraulic connectivity under a variety of flow conditions (Figure 4.15-19).

Enhanced stream culverts would be used at key locations to provide small vertebrates with riparian corridor connections. At selected bridges and culverts, the existing structure would be replaced with a structure that provided a shelf, a minimum of 16 inches wide, above the water elevation on each side of the stream channel. These would also be provided with extended drift fence wing-walls to direct animals to the crossing (Figure 4.15-20). Constructing rare species and/or wildlife underpasses and maintaining existing riparian corridors allows wildlife movement to continue. Many species, including large and small mammals, reptiles, and amphibians, will use areas under bridges to access breeding and feeding areas. Wildlife underpasses can maintain travel passages for rare species that may be unable to cross the tracks (such as salamanders and turtles). Drift fences would be installed to facilitate rare species/wildlife passage by directing movement to these underpasses. Additional fencing may be necessary to prevent larger turtles such as the Blanding's turtle from getting between the rails

Underpasses would also be constructed in the vicinity of vernal pools as well as in or near areas with landscape features that provide a connective function (such as shrubby areas that provide cover). The underpasses would be designed with a natural substrate and, where feasible, natural light to encourage some species to use culverts.[53] Topography presents a constraint to installing dry wildlife underpasses. Where the railroad is at-grade or in a cut, it is not practicable to install underpasses unless extensive excavation is done (potentially extending outside of the right-of-way) to create a 6-foot deep slope to the underpass. In such situations, under-rail troughs are preferable.

[53] Jackson, S.D. and C.R. Griffin. 1998. In Proceedings of the international conference on wildlife ecology and transportation (G.L. Evink, P. Garrett, D. Zeigler, and J. Berry, eds.). Report No. FL-ER-69-98. Tallahassee, FL.

Under rail troughs would be constructed within upland areas where no railroad infrastructure currently occurs, in areas where the reconstructed tracks could interrupt migratory patterns of blue-spotted salamander, eastern box turtle, or Blanding's turtle. This crossing structure was used successfully in another rail project in Massachusetts, the Greenbush Rail Line Project. This crossing structure was used successfully in another rail project in Massachusetts, the Greenbush Rail Line Project. This type of crossing structure has been previously reviewed and approved by regulatory agencies as a successful wildlife crossing structure. This crossing demonstrated to work well for spotted turtles, and may need refining and testing to appropriately size for larger turtles such as Blanding's turtle and eastern box turtles. The under-rail troughs include a liner between or below three consecutive rail ties that creates a 7- to 8-inch gap underneath the rails (Figure 4.15-20). Drift fences are installed on either side of the crossing to direct animals to the opening. These under-rail troughs could also be installed adjacent to grade crossings to allow turtles that wander onto the tracks to escape. NHESP recommended that the troughs be as deep as possible and lined with a natural material (not plastic), the wingwall guides should be a permanent material (not wood), and that a long-term monitoring and maintenance program established for continued function.

To mitigate for impacts to blue spotted salamander and Blanding's turtle, existing culverts would be enhanced along the segment between Depot Street and south of Foundry Street, and a new bridge that meets Commonwealth of Massachusetts stream crossing standards would be provided at Black Brook. NHESP requested that each of these structures be as wide as possible, preferably using bridges at all locations. If feasible, and there are no structural and/or grading constraints, additional wildlife crossings may be provided adjacent to some of the enhanced culverts. These additional crossings may take the form of dry culverts that can provide crossing opportunities for non-water dependent species. Mitigation for impacts to eastern box turtles would include constructing up to three under-rail troughs between the proposed Raynham Park Station site and Bridge Street to allow passage of wildlife between habitats separated by the tracks. Figures 4.15-21 and 4.15-22 shows potential locations for these passages. The final design and locations of these passages would be identified in consultation with NHESP; however, preliminary locations of these measures are identified in the Chapter 4.14, *Biodiversity, Wildlife, and Vegetation,* and on Figures 4.14-11a-e, 4.14-12a-d, 4.14-13a-c, 4.14-14a-b.

Post-Construction Maintenance

Right-of-way maintenance is critical to the protection of the tracks and ties and to maintaining railroad safety. Right-of-way maintenance is done in accordance with an approved VMP and YOPs. Adherence to an approved VMP, as implemented in conjunction with YOP, restricts the use of herbicides in areas adjacent to wetlands or sensitive resources. Sensitive areas include wetlands within 10 feet of surface waters or wetlands where there is no herbicide use application. Water resources and proposed stormwater management is described separately in Chapter 4.17, *Water Resources.*

Enhance and Replace Habitat

Opportunities to enhance and replace habitat for eastern box turtles, Blanding's turtles and blue-spotted salamanders are limited along the railroad right-of-way through Easton and Raynham. Adjacent areas are permanently protected open space, intact natural landscapes, or maintained golf courses. One mitigation opportunity in Easton would be to restore an abandoned gravel pit potentially used for turtle nesting. This could be planted with low, clump-forming native perennials interspersed with shrub species. This proposed nesting habitat could be maintained to provide sunny, well drained habitat preferred by nesting females. The area would need to be fenced and signed to exclude ATVs, which currently use the sand pit.

The applicant would enhance, restore, and replace wetlands and their respective functions and values impacted by the project corridors. Wetland mitigation areas adjacent to the project corridors would provide suitable habitat for several rare species and would be planted with water-willow and shrub species used by the pale green pinion moth.

Wetlands and their respective functions and values that are impacted by the Alternatives would need to be enhanced, restored, and replaced. Wetland mitigation areas adjacent to the Alternatives corridors could provide suitable habitat for several rare species. Wetland impacts and proposed mitigation are described separately in Chapter 4.16, *Wetlands*.

Native species such as Atlantic white cedars would be planted along the project alignment in areas where temporary wetland impacts would be restored, in Pine Swamp and the Assonet Cedar Swamp, to discourage invasion by weedy species in newly disturbed areas along the right-of-way. In addition, the applicant would investigate control methods that would remove or restrict invasive species that could spread into adjacent, high-value forested wetlands used by state-listed species. Chapter 4.14, *Biodiversity*, *Wildlife, and Vegetation*, provides more detailed information on the invasive species monitoring and control program.

Habitat Protection/Preservation

Long-term net benefits to rare species found along the project corridors would be provided by assuring permanent protection of the wetland and upland habitats of these species. Examples of habitat protection/preservation include:

- Acquiring land or conservation restrictions that protect identified critical habitats that are at risk of loss or degradation.

- Contributing to the mitigation bank for land protection of species such as the eastern box turtle.

NHESP, through its BioMap Program, has identified the Hockomock Swamp, Pine Swamp and other areas along the project corridors as “Core Habitat’, and has identified adjacent areas of “Supporting Natural Landscape.” Little of the Supporting Natural Landscape of these locations is protected. Portions of the Assonet Cedar Swamp are owned by the Massachusetts Audubon Society (although not protected by a Conservation Restriction). Areas adjacent to the Hockomock Swamp include suitable habitat for eastern box turtle and Blanding’s turtle, but are currently not protected.

Eastern Box Turtle (*Terrapene carolina carolina*) Habitat Bank—

The MESA regulations at 321 CMR 10.23(6)(b)(2), applicable to the eastern box turtle, state that:

> “The applicant shall provide off-site mitigation, or a combination of on-site and off-site mitigation subject to the Division's approval, that achieves the long-term Net Benefit standard in 321 CMR 10.23(1), as determined by the Division [of Wildlife]. Any off-site mitigation provided by the applicant in the form of a financial contribution will be used to fund habitat management or the protection of land or other appropriate mitigation within one or more conservation protection zones established in the conservation plan issued by the Division pursuant to 321 CMR 10.26. The amount of any such off-site mitigation payment will be determined by the Division based on a formula set forth in written guidance that, at a minimum, considers the area

of impact on the on-site habitat of the affected State-listed Species of Special Concern and the land values within one or more of the conservation protection zones."

The off-site mitigation proposed to achieve the long-term Net Benefit standard for impacts to eastern box turtle habitat consists of a financial contribution from the applicant to the NHESP's eastern box turtle habitat bank. The amount of such payment would be determined by the Division.

Once an appropriate mitigation ratio (the amount of land to be protected vs. the amount of habitat loss) is established by NHESP and the Corps, and an appropriate parcel is identified, the property would be acquired either through acquisition in fee or permanent conservation restriction.

Research Program

The majority of the species potentially affected by the rail reconstruction have also been studied at other locations in Massachusetts, and further investigations may not provide useful data that would contribute to the long-term health of these species. However, funding could be provided for scientific research on other state-listed species to enhance knowledge of their conservation biology and protection. Funding could also be provided for research programs within important Priority and Estimated Habitats impacted by the project corridors such as the Hockomock Swamp. The scope of these research programs focused on two of the species affected by the project could yield valuable information that would contribute to their protection and conservation.

Blanding's Turtle (*Emydoidea blandingii*)—Very little information is available about the Hockomock Swamp population of Blanding's turtle, other than anecdotal evidence and a few road-kills. The size, age structure, distribution, movements, and critical habitat areas (nesting, overwintering) have not been determined. A detailed study of this population would provide a net benefit to the species by helping to ensure that critical habitats are protected, and that effective measures to reduce road mortality are developed and installed.

Hessel's Hairstreak (*Callophrys hesseli*)—Very little information about the distribution and abundance of this species in Southeastern Massachusetts is available. The population may have been extirpated from the Hockomock Swamp since 2000 as a result of aerial spraying for mosquitos, and the abundance in Pine Swamp and the Assonet Cedar Swamp has not been recorded. The butterfly is not reported from the Acushnet Cedar Swamp despite the occurrence of suitable habitat. Studies to ascertain the distribution and abundance of this species within the Hockomock, Pine, Assonet, and Acushnet Cedar Swamps would inform the management plans for these properties, and could provide a net benefit by implementing mosquito control measures in sensitive areas that are not/are less lethal to Lepidoptera.

Stoughton Electric Alternative

For the Stoughton Alternative, mitigation would be focused on sections of the Stoughton Line within mapped habitat of blue-spotted salamander, Blanding's turtle, and eastern box turtle in areas outside of the limits of the proposed trestle. The Stoughton Line is an inactive line without tracks and ties for most of its length, and construction of a new rail would interrupt migratory corridors potentially used by these species. Impacts to these species would be avoided where the trestle is constructed through the Hockomock Swamp. Areas of mapped habitat for these species also exist between Depot Street and Foundry Street and between the proposed Raynham Park station site and Bridge Street, beyond the limits of the proposed trestle. For these segments, additional mitigation measures such as wildlife crossings would be required.

As a state threatened species, MESA regulations at 321 CMR 10.23(7) establish certain performance standards including mitigation ratios to achieve the long-term Net Benefit performance standard. These ratios are based on the amount of areal habitat impacted and the category of state-listed species. Accordingly, for Blanding's turtle, a 2:1 mitigation ratio is required. This species would have a loss of 12.5 acres of potential upland habitat, and approximately 1.9 miles of new track (with one new bridge, enhanced culverts and between-the-ties crossing structures) would create a barrier to movement in three segments. To provide a net benefit, the applicant has agreed to provide funding to protect 25 acres of land potentially used by the Hockomock Swamp population of Blanding's turtle, as well as to fund a study of this population that would determine the size and status of the population, identify nesting areas, identify important non-breeding areas, and identify locations where migratory pathways cross Route 138.

As a state species of special concern, MESA regulations at 321 CMR 10.23(7) establish certain performance standards including mitigation ratios to achieve the long-term Net Benefit performance standard. These ratios are based on the amount of areal habitat impacted and the category of state-listed species. Accordingly, for eastern box turtle, a 1.5:1 mitigation ratio is required. This species would experience a loss of 12.6 or 13.8 acres of potential habitat with the Stoughton or Whittenton Alternative, respectively (successional habitats along the railbed) and approximately 0.9 to 1.3 miles of new track (with between-the-ties crossing structures) would create a barrier to movement. To provide a net benefit, applicant has agreed to provide funding to the eastern box turtle mitigation bank equivalent to protecting 17 acres, or to protect 17 acres of habitat available to this population.

As a state species of special concern, MESA regulations at 321 CMR 10.23(7) establish certain performance standards including mitigation ratios to achieve the long-term Net Benefit performance standard. These ratios are based on the amount of areal habitat impacted and the category of state-listed species. Accordingly, for the blue-spotted salamander (State Special Concern), a 1.5:1 mitigation ratio is required. This species would have a loss of approximately 7.5 acres of upland habitat, and approximately 0.4 mile of new track (with enhanced culverts and a dry wildlife crossing) would create a barrier to movement in two locations. To provide a net benefit, the applicant has agreed to provide funding to protect approximately 11 acres of land potentially used by the Hockomock Swamp population of blue-spotted salamander.

The applicant anticipates that the land protection for the Blanding's turtle and blue-spotted salamander may overlap, and may be combined with wetlands preservation required for wetland mitigation

The re-establishment of commuter rail service along the rail bed would effectively eliminate the use of the corridor by ATVs, bicycles and pedestrians. Further measures could be taken to ensure that other ATV tracks throughout priority habitats are closed and extant vernal pools are protected from ATV use that negatively affects turtle and salamander habitat.

For the remainder of the species potentially impacted by this alternative, no mitigation has been proposed because:

- there would only be minor losses on the edge of the Priority Habitats and on the edge of the right-of-way;
- there would be no interruption of their migratory corridors; and
- impacts could be eliminated or reduced in final design.

In areas where no mitigation is proposed, there are culverts that would be replaced and are expected to benefit and provide improved crossing opportunities for rare and/or other wildlife species. For example, if there are no structural constraints, existing 5-foot culverts may be replaced with 8-foot wide culverts to provide additional wildlife crossing opportunities. Such enhanced culverts can be embedded to provide natural substrate within the culvert and to maintain hydraulic connectivity under a variety of flow conditions.

As previously suggested, habitat could be enhanced and restored for species dependent on particular habitat types. This could be accomplished by planting native species such as Atlantic white cedar.

Stoughton Diesel Alternative

Mitigation measures for impacts to rare species for the Stoughton Diesel Alternative are the same as the mitigation identified in the Stoughton Electric Alternative, because the impacts to rare species habitat would be the same.

Whittenton Electric Alternative

The mitigation measures proposed for the Whittenton Alternative would be similar to those proposed for the Stoughton Alternative. The major difference would be measures proposed for the eastern box turtle habitat found along the Whittenton Branch. Under-rail troughs would be constructed to connect upland areas within this Priority Habitat. Figure 4.15-30-31 shows the potential location for these passages. The final design and locations of these passages would be identified in consultation with NHESP.

Whittenton Diesel Alternative

Mitigation measures for impacts to rare species along the Whittenton Diesel Alternative are the same as the mitigation identified the Whittenton Electric Alternative, because the impacts to rare species habitat would be the same.

Some of the general mitigation measures common to all alternatives include:

- Constructing wildlife corridors/passages (e.g., enhanced stream culverts/oversized culverts, between-tie crossings and under-rail troughs)
- Timing and methods of construction
- Post-construction maintenance
- Enhancing and replacing habitat by off-site habitat protection and preservation
- Funding of research programs to benefit state-listed species

Specific mitigation measures (wildlife passages/corridors) would be provided and focused on project corridors where there would be loss of migratory route habitat. These areas include rare species Priority and Estimated Habitat found within out-of-service portions of the Stoughton Line and Whittenton Branch. No mitigation would be provided for the impacts for the Rapid Bus Alternative other than contribution to the eastern box turtle mitigation bank.

Table 4.15-13 provides a summary of the proposed structural mitigation measures for the rare species impacted by the South Coast Rail alternatives. Coordination with regulatory agencies has continued throughout the determination of the LEDPA, and would continue through selection of a final design, fine-grained analysis of actual habitat boundaries and impacts, and development of a detailed mitigation plan.

Table 4.15-13 Proposed Mitigation Measures for Rare Species

Element	Description	Quantity
Wildlife Crossings	Reconstruct culverts within Blanding's turtle (*Emydoidea blandingii*), blue-spotted salamander (*Ambystoma laterale*), eastern box turtle (*Terrapene carolina carolina*) habitat to enhance wildlife passage	To Be Determined (TBD)
	Construct between-the-ties crossing structures	TBD
	Construct below-grade wildlife crossing	TBD
Habitat Enhancement	Protect Easton sand pit	TBD
	Restore areas of temporary wetland impact in Pine Swamp and Acushnet Cedar Swamp with host plant species for state-listed Lepidoptera	TBD
Population Studies	Blanding's turtle (*Emydoidea blandingii*)	Hockomock Swamp population
	Hessel's hairstreak *(Callophrys hesseli)*	Southeastern Massachusetts
Habitat Protection[1]	Blanding's turtle (*Emydoidea blandingii*)	TBD (up to 25 acres)
	Blue-spotted salamander (*Ambystoma laterale*)	TBD (up to 11.25 acres)
Mitigation Bank (or habitat protection)	Eastern box turtle (Terrapene carolina carolina)	TBD (up to 17 acres)

4.15.4 **Regulatory Compliance of the Alternatives**

This section describes the federal and state regulations that protect rare species and, in some instances, their habitats, and describes how each alternative would comply.

4.15.4.1 Federal Endangered Species Act

The ESA of 1973, (16 USC 1531 *et seq.,* as amended),[54] authorizes the determination and listing of species as Endangered and Threatened and prohibits unauthorized taking, possession, sale, and transport of endangered species.

Section 7 of the Act[55] requires federal agencies to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or to modify their critical habitat. The USFWS and NMFS administer the Act. Under Section 7, Federal agencies must

[54] Endangered Species Act of 1973, Section 7(16 USC 1531 *et seq.,* as amended), United States Fish and Wildlife Service.
[55] 6 U.S.C. 1536.

consult with the appropriate ESA agency when any action the agency carries out, funds, or authorizes (such as through a permit) may affect a listed endangered or threatened species.

The NMFS, a division of the U.S. Department of Commerce, is the federal agency responsible for protecting living marine resources including endangered marine life under the ESA. On December 4, 2008 a letter was submitted to the NMFS requesting information on any threatened and endangered fisheries resources located within the project area. NMFS response was received on January 12, 2009, with the determination that there are no federally endangered fisheries resources in the vicinity of the proposed project. Since the publication of the DEIS, the New York Bight Distinct Population Segment of Atlantic sturgeon was listed as endangered under the ESA by the NMFS on April 6, 2012.[56] Therefore, the Corps coordinated with NMFS to determine whether the Build Alternatives would affect this species. However, the NMFS stated in its May 13, 2013, response letter it is unlikely that any species listed under their jurisdiction will be exposed to any direct or indirect effects of the proposed South Coast Rail project, including the Atlantic sturgeon (see correspondence in Appendix 4.15-A). Therefore, further Section 7 consultation with NMFS is not necessary.

4.15.4.2 Massachusetts Endangered Species Act

Massachusetts enacted MESA in 1990. The Act (M.G.L. Chapter 131A) and its regulations (321 CMR 10.00) prohibit the "taking" of any state-listed rare plants and animals unless specifically permitted for scientific, educational, or propagation purposes, or where a Conservation and Management Permit is issued. "Take" includes protection of rare species habitat, and is defined as, "*in references to animals to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat*."

The regulations (321 CMR 10.05) state that "All State Agencies shall review, evaluate, and determine the impact on Endangered, Threatened and Special Concern species or their habitats… and use all practicable means and measures to avoid or minimize damage to such species or their habitats." State agencies are responsible for demonstrating to the Secretary that all practicable means and measures to protect rare species and their habitats have been incorporated into the project design. The Massachusetts Department of Fish and Wildlife's (DFW) Natural Heritage and Endangered Species Program (NHESP) is the agency responsible for ensuring compliance with MESA. If a proposed project would result in a "take," the project must obtain a Conservation and Management Permit from the NHESP.

With the exception of the No-Build Alternative, the two rail alternatives would result in a "take" of rare species and would require that NHESP issue a Conservation and Management Permit. As demonstrated in this chapter, the applicant has assessed practical alternatives that would avoid and minimize impacts to state-listed species, and could therefore comply with the regulatory performance standards. The amount of habitat impacted would ultimately be determined in the permitting process based on actual field delineation of rare species habitat, and would include a detailed analysis of actual habitat boundaries. Coordination with regulatory agencies has continued throughout the determination of the

[56] Federal Register: February 6, 2012 (Volume 77, Number 24, page 5880-5912), Endangered and Threatened Wildlife and Plants; Threatened and Endangered Status for Distinct Population Segments of Atlantic Sturgeon in the Northeast Region.

LEDPA, and would continue throughout subsequent phases including selection of a final design, and development of a detailed mitigation plan.

Avoidance and Minimization

MESA regulations at 321 CMR 10.05 state that "All State Agencies shall review, evaluate, and determine the impact on Endangered, Threatened and Special Concern species or their habitats and use all practicable means and measures to avoid or minimize damage to such species or their habitats." State agencies are responsible for demonstrating to the Secretary that all practicable means and measures to protect rare species and their habitats have been incorporated into the project design.

As documented in this chapter, the applicant has evaluated two route alternatives (Stoughton, and Whittenton) and determined neither of these alternatives would avoid impacts to rare species habitat. Potential impacts to state-listed species habitats have been minimized to the extent practicable, as described in this chapter. Impacts to state-listed species within the Hockomock Swamp have been minimized through the construction of a 1.8 mile elevated trestle, which would not create a barrier to the movement of reptiles or amphibians between wetland habitats. Table 4.15-13 describes the mitigation measures that would further minimize the effects of the alternatives by minimizing impacts during construction, enhancing migratory routes, and restoring areas of temporary alteration.

Alternatives

321 CMR 10.23(2)(a) requires that an applicant adequately assess alternatives to both temporary and permanent impacts to state-listed species. The applicant has evaluated two alternatives (Stoughton, and Whittenton) and determined that neither of these alternatives would avoid impacts to rare species habitat. The Stoughton and Whittenton Alternative meet the project purpose, and would have equivalent impact to state-listed species.

Insignificant Portion of the Local Population

321 CMR 10.23(2)(b) requires that a Conservation and Management Permit may only be issued where "an insignificant portion of the local population would be impacted by the Project or Activity".

As demonstrated in this chapter, the impacts to habitat of each of the state-listed species affected by the two alternatives would be a negligible portion of the total available habitat.

Net Benefit

321 CMR 10.23(2)(c) requires that a Conservation and Management Permit may only be issued where "the applicant agrees to carry out a conservation and management plan that provides a long-term Net Benefit to the conservation of the State-listed species".

The MESA regulations at 321 CMR 10.23(7) establish certain performance standards including mitigation ratios to achieve the long-term Net Benefit performance standard. These ratios are based on the amount of areal habitat impacted and the category of state-listed species.

- Endangered species require a mitigation ratio of 3:1 (three times the amount of affected habitat).
- Threatened species require a mitigation ratio of 2:1.

- Special Concern species require a mitigation ratio of 1.5:1.

The Director may approve an alternative mitigation approach that differs from these ratios where the alternative approach is appropriate, considering factors that include but are not limited to:

- The size and configuration of the habitat impact
- The threats to the affected state-listed species posed by uses or activities located adjacent to or in close proximity to the project
- The size, configuration and quality of the habitat proposed to be protected
- The population density of the affected state-listed species
- The habitat management and research needs associated with the affected species

The proposed project would provide a net benefit to the affected species by funding the protection of habitat at the appropriate ratio taking into consideration the loss of wetland and upland habitat as well as the length of the potential barrier to movement and the number and effectiveness of the proposed enhanced culverts and between-the-ties crossing structures.

For Blanding's turtle, a 2:1 mitigation ratio is required. This species would have a loss of 12.5 acres of potential upland habitat, and approximately 1.9 miles of new track (with new bridge, enhanced culverts and between-the-ties crossing structures) would create a barrier to movement in three segments. To provide a net benefit, the applicant has agreed to provide funding to protect 25 acres of land potentially used by the Hockomock Swamp population of Blanding's turtle, as well as to fund a study of this population that would determine the size and status of the population, identify nesting areas, identify important non-breeding areas, and identify locations where migratory pathways cross Route 138.

For eastern box turtle (State Special Concern), a 1.5:1 mitigation ratio is required. This species would experience a loss of 12.6 and 13.8 acres of potential habitat (successional habitats along the railbed) and approximately 0.9 to 1.3 miles of new track (with between-the-ties crossing structures) would create a barrier to movement by the Stoughton and Whittenton Alternatives, respectively. To provide a net benefit, the applicant has agreed to provide funding to the eastern box turtle mitigation bank equivalent to protecting 17 acres, or to protect 17 acres of habitat available to this population.

For the blue-spotted salamander (State Special Concern), a 1.5:1 mitigation ratio is required. This species would have a loss of approximately 7.5 acres of upland habitat, and approximately 0.4 mile of new track (with two enhanced culverts and a dry wildlife crossing) would create a barrier to movement in two locations. To provide a net benefit, the applicant has agreed to provide funding to protect approximately 11 acres of land potentially used by the Hockomock Swamp population of blue-spotted salamander.

The applicant anticipates that the land protection for the Blanding's turtle and blue-spotted salamander may overlap, and may be combined with wetlands preservation required for wetland mitigation.

4.15.4.3 Massachusetts Wetlands Protection Act

The Wetlands Protection Act Regulations (WPA [310 CMR 10.00 et seq.]) state that proposed projects that alter estimated rare wildlife habitat shall not be permitted to have any short-term or long-term

adverse effects on the habitat of the local population of that species. The regulations only apply to proposed projects that would alter the habitat of a rare animal species occurring in a wetland resource area for which an occurrence has been entered into the official NHESP database. Rare plants are not regulated under the WPA. The NHESP maintains an atlas of Estimated Habitat for state-listed rare species, which it updates every two years (most recently in 2008).

The NHESP has been consulted regularly by the Applicant throughout the course of the project and if work is proposed within Estimated Habitat, a Notice of Intent for a proposed project must be submitted to NHESP concurrent with the conservation commission submittal. All of the alternatives would likely result in a “take” of state-listed species and would result in both short- and long-term impacts to wetlands containing rare species habitat, and therefore would not comply with WPA performance standards. A variance under the WPA regulations, if granted, could be issued following NHESP’s approval of the CMP.

4.16 WETLANDS

4.16.1 Introduction

This chapter explains the jurisdictional authority and wetland regulatory procedures, and describes the methods and procedures used to delineate wetland resource areas along the South Coast Rail alternatives. This chapter also presents the methods used to quantify the direct impacts (both permanent and temporary) to all categories of wetland resource areas, and the methods used to assess secondary and/or indirect impacts to wetland functions and values. Finally, this chapter identifies the goals and opportunities for wetland mitigation, based on regulatory requirements and wetland impacts presented.

The results of an initial analysis of wetland impacts along the South Coast Rail project corridor were presented in the Draft EIS/EIR. The Secretary's Certificate on the DEIR/DEIS required further analysis or discussion on several aspects of wetland impacts in the FEIR. The Certificate stated that:

- "The FEIR should document any revisions to wetland boundaries and project-related impacts based on more detailed field delineations for the proposed Stoughton route, and boundaries as approved by local Conservation Commissions."
- "The FEIR should quantify temporary as well as permanent wetland impacts, for individual project components and cumulatively for the entire project (including stations and layover facilities)."
- "Direct and indirect wetlands impacts related to canopy clearance should be further evaluated in the FEIR."
- "Where there are differences in categorization under state and federal regulations, the FEIR should clarify and differentiate as appropriate. The FEIR should include a summary table with a breakdown of all wetland resource impacts (including BVW, Bank, Riverfront Area, and BLSF) for the entire project (rail, stations/layovers, roadway improvements, and other components) so that the individual resource impacts and the cumulative totals are summarized in one place."
- "The FEIR should include information on the location and volume of BLSF that will be impacted by the project."
- "The FEIR should quantify the total area of Riverfront Area impacted by the project, provide a breakdown of impacts at specific locations, describe how work proposed in riverfront will meet applicable performance standards."
- The FEIR should expand upon the analysis of wetlands functions and values in the DEIR/S to include a more detailed analysis for the proposed Stoughton rail. The FEIR should include narrative descriptions of wetlands functions and values of each wetland impacted directly and indirectly by the proposed project."

4.16.2 Resource Definition

The term "wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.[1] These areas are characterized by hydric soils, hydrophytic vegetation, and standing water or saturated soils. Wetlands provide benefits including flood storage, storm protection, ground water recharge, water filtration, and wildlife habitat. A full description of wetland resources, including their function and values, can be found in Section 4.16.2.1. Under MGL, Chapter 131, Section 40, "freshwater wetlands", are wet meadows, marshes, swamps, bogs, areas where groundwater, flowing or standing surface water or ice provide a significant part of the supporting substrate for a plant community for at least 5 months of the year; emergent and submergent plant communities in inland waters; that portion of any bank that touches any inland waters. There are several types of state regulated wetlands including: Bank, Bordering Vegetated Wetlands (BVW), Land under Waterbodies and Waterways (LUW), Land Subject to Flooding (LSF), and Riverfront Area (RA).

Wetland Resource Areas as defined in the Massachusetts WPA and its implementing regulations[2] that occur within the South Coast Rail project corridor include these inland and coastal resource areas:

- Bank;
- Bordering Vegetated Wetlands (BVW);
- Land Under Waterbodies and Waterways (LUW);
- Bordering Land Subject to Flooding (BLSF);
- Isolated Land Subject to Flooding (ILSF);
- Riverfront Area (RA);
- Land Subject to Coastal Storm Flowage (LSCSF); and
- Coastal Bank.

This section provides a brief description of the regulatory criteria defining each of these resources.

Bank—As defined in 310 CMR 10.54 (2)(a)&(c), a Bank is "... *the portion of the land surface that normally abuts and confines a waterbody.*" This land surface "... *may be partially or totally vegetated, or it may be comprised of exposed soil, gravel, or stone.*" "*The upper boundary of a Bank is delineated as the first observable break in the slope or the mean annual flood level, whichever is lower.*" Bank is present between a perennial river, lake or pond and the adjacent BVW or upland and within intermittent streams.

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[1] Code of Federal Regulations (CFR) Title 33, Part 328.3(b), Definition of Waters of the United States.

[2] 310 CMR 10.00 et seq. http://www.lawlib.state.ma.us/source/mass/cmr/cmrtext/310CMR10.pdf, accessed June 1, 2012.

The regulations define a stream as "*a body of running water which moves within, into or out of an Area subject to protection of the Act… Such a body of running water that does not flow throughout the year (i.e. intermittent) is a stream except for that portion upgradient of all bogs, swamps, wet meadows and marshes.*" Accordingly, only those intermittent channels that convey water in response to a hydraulic gradient and those that are within or downgradient of BVW contain the resource area Bank.

Bordering Vegetated Wetlands (BVW)—As defined in 310 CMR 10.55(2)(a), "*Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes.*" Bordering Vegetated Wetland (BVW) boundaries are defined in 310 CMR 10.55(2)(c) as "... *the line within which 50 percent or more of the vegetational community consists of wetland plants and saturated or inundated conditions exist.*"

Land Under Waterbodies and Waterways (LUW)—Land under Waterbodies and Waterways "*is the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock. The boundary of Land Under Waterbodies and Waterways is the mean annual low water level*" [310 CMR 10.56 (2)(a)&(c)].

Vernal Pools—Vernal pools are not regulated under the WPA as a wetland resource area. Vernal pool habitats, as defined in 310 CMR 10.04, are "confined basin depressions, at least in most years, holding water for a minimum of two continuous months during the spring and/or summer," and must be within a regulated wetland resource area to be protected under the WPA. Vernal pool habitat includes the certified pool itself and all land within 100 feet of the pool that is also within a resource area. The presence of vernal pool habitat indicates that the wetland resource area provides important wildlife habitat. Vernal pools are described in Chapter 4.14, *Biodiversity, Wildlife and Vegetation*. Vernal pools discussed in this document are certified, potential, and field verified vernal pools located in wetlands within 750 feet of the right-of-way.

Bordering Land Subject to Flooding (BLSF)—"*Bordering Land Subject to Flooding is an area with low flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds, or lakes. It extends from the banks of these waterways and waterbodies; where a bordering vegetated wetland occurs, it extends from said wetland*" [310 CMR 10.57(2)(a)]. "*The boundary of Bordering Land Subject to Flooding is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm… determined by reference to the most recently available flood profile data prepared for the community within which the work is proposed… under the Federal Emergency Mapping Agency…*" [310 CMR 10.57(2)(c)].

Isolated Land Subject to Flooding (ILSF)—"*Isolated Land Subject to Flooding is an isolated depression or closed basin without an inlet or outlet. It is an area which at least once a year confines standing water to a volume of one quarter acre-foot and an average depth of six inches*" [310 CMR 10.57(1)(b)].

Riverfront Area (RA)—Riverfront Area is "*the area of land between a [perennial] river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away.*" [310 CMR 10.58 (2)(a)3]. Riverfront Area occurs at all locations where the right-of-way crosses a perennial watercourse, or is within 200 feet of a perennial watercourse. The regulatory presumptions regarding the intermittent or perennial nature state that "*if a river or stream is shown as intermittent or not shown on the current USGS map, or more recent map provided by the Department, an assertion that it is perennial must be supported by evidence…*" [310 CMR 10.58(2)(1)(a)].

Land Subject to Coastal Storm Flowage (LCSCF)—"*Land Subject to Coastal Storm Flowage means land subject to any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater.*" [310 CMR 10.04].

Coastal Bank—"*Coastal Bank means the seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of a coastal beach, land subject to tidal action, or other wetland.*" [310 CMR 10.30].

Wetland resources in Massachusetts are regulated under local, state, and federal programs. The following section describes the regulatory context of the federal Clean Water Act (CWA), Massachusetts Wetlands Protection Act (the Act) and the local Bylaws.

4.16.3 Regulatory Context

The South Coast Rail project requires regulatory review under federal and state wetlands regulatory programs, as described below.

4.16.3.1 Section 404 of the Federal Clean Water Act

Section 404 of the Clean Water Act requires a Department of the Army (DA) permit for the discharge of dredged or fill material into waters of the United States,[3] including adjacent wetlands. The South Coast Rail project would require the issuance of an Individual Section 404 Permit (i.e., would not be eligible for the Massachusetts General Permit) as it would result in the loss of more than one acre of waters of the U.S. (including adjacent wetlands).

4.16.3.2 Section 10 of the Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 requires a DA permit for all work or structures (except bridges) in, under or over navigable waters of the United States.[4] In New England, for purposes of Section 10, navigable waters of the United States are those subject to the ebb and flow of the tide and a few of the major waterways used (presently or historically) to transport goods or services sold in interstate or foreign commerce. The Taunton River is a navigable waterway to the South Street East Bridge, in Taunton. It would be crossed by the Stoughton Alternative. In addition, the Mill River is navigable from its confluence with the Taunton River upstream to the Spring Street bridge in Taunton. It also would be crossed by the Stoughton Alternative.

Pursuant to a the General Bridge Act of 1946, 33 U.S.C. 525 et seq., the United States Coast Guard regulates bridges over waters regulated under Section 10. MassDOT would be required to obtain a bridge permit from the Coast Guard for reconstruction of bridges over the Taunton or Mill Rivers. The discharge of fill material associated with supporting structures such as bridge abutments would also be regulated by the Corps under the Corps' Section 404 authority noted above.

4.16.3.3 Section 401 of the Clean Water Act (Water Quality Certification)

Section 401 of the Clean Water Act (33 U.S.C. 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to

[3] Code of Federal Regulations (CFR) Title 33, Part 328.3(a), Definition of Waters of the United States.
[4] Code of Federal Regulations (CFR) Title 33, Part 329.4, Definition of Navigable Waters of the United States.

obtain a certification from the State in which the discharge originates or would originate, that the discharge will comply with the applicable effluent limitations and water quality standards.[5] In addition, the Massachusetts Department of Environmental Protection (DEP) is required to issue Water Quality Certifications for projects that result in discharge of fill to a wetland or waterbody, pursuant to the Massachusetts Clean Waters Act (M.G.L. c. 21 §§ 26 – 53). The South Coast Rail project would require issuance of an individual Section 401 Water Quality Certification because it would result in the loss of more than 5,000 square feet of wetlands subject to federal jurisdiction.

4.16.3.4 Coastal Zone Management

Section 307(c) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)), requires any non-federal applicant for a federal license or permit to conduct an activity affecting land or water uses in the state's coastal zone to furnish a certification that the proposed activity will comply with the state's coastal zone management program. Generally, no permit will be issued until the state has concurred with the non-federal applicant's certification. This provision becomes effective upon approval by the Secretary of Commerce of the state's coastal zone management program[6]. Accordingly, coastal zone consistency certification must be conferred by the Massachusetts Office of Coastal Zone Management before MassDOT can proceed with activities authorized by any DA permit.

The Coastal Zone Management (CZM) program has a series of policies that apply to activities within the Massachusetts Coastal Zone. Projects subject to federal consistency review (particularly activities subject to permitting under the Clean Water Act, Section 404) must be consistent with the CZM program policies. Under the Massachusetts CZM program all MEPA projects are reviewed for consistency with the management principles of CZM, which are intended as guidance for any activities proposed in the Coastal Zone. The overall goal of coastal zone management is to protect coastal resources from contamination or degradation, prevent the creation of coastal hazards, and maximize the public use and benefit of coastal areas.

Additional information regarding compliance with the Coastal Zone Management program can be found in Chapter 4.18, *Coastal Zone Consistency and Chapter 91*.

Table 4.16-1 identifies the municipalities in the study area that are at least partially within the Massachusetts Coastal Zone.

Table 4.16-1 Study Area Communities Within the Coastal Zone

Municipalities Within Coastal Zone		
Acushnet	Fall River	Rehoboth
Berkley	Freetown	Somerset
Dartmouth	Mattapoisett	Swansea
Dighton	New Bedford	Westport
Fairhaven		

[5] Code of Federal Regulations (CFR) Title 33, Part 320.3(a), General Regulatory Policies.
[6] Code of Federal Regulations (CFR) Title 33, Part 320.3(b), General Regulatory Policies.

4.16.3.5 Massachusetts Wetlands Protection Act

The Massachusetts Wetlands Protection Act (WPA) regulations establish performance standards for work proposed within each of the resource areas, and require review of any work proposed within 100 feet of a wetland resource to determine if that work will result in the alteration of wetland resources. "Alteration" is defined to "include a change in vegetation, hydrology, or water quality of the wetland."

Outstanding Resource Waters

Massachusetts regulations designate certain areas as Outstanding Resource Waters (ORWs), "as determined by their outstanding socioeconomic, recreational, ecological and/or aesthetic values." ORWs in Massachusetts include public drinking water supplies, as well as tributaries to these supplies. Vernal pools are also designated as ORWs.

4.16.3.6 Local Wetland Bylaws and Ordinances

Several communities along the right-of-way corridors enforce local wetlands protection bylaws that may further regulate many of these resource areas. The United States Army Corps of Engineers (Corps) as a federal agency is not subject to local laws and regulations. As a state agency, MassDOT is exempt from local bylaws and local bylaws are not addressed in this document.

4.16.4 Regulatory Procedures and Definitions

4.16.4.1 Wetland Identification During the DEIS/DEIR

This section describes the initial efforts to document existing wetlands adjacent to the South Coast Rail alternatives presented in the DEIS/DEIR.

Methodology

Each alternative corridor was assessed for the presence of wetland resources within and adjacent to the right-of-way. In addition to the right-of-way, each of the proposed station sites and layover facilities was evaluated for the presence of wetlands on-site and on abutting properties. Three sources of information were used to determine the approximate limits of existing wetlands, their cover type and their connectivity to larger wetland systems. The sources of information included (1) existing information available from previous Orders of Resource Area Delineation (ORADs) that were issued in 2000-2002, (2) GIS mapping using data available from MassGIS[7], and (3) field verification in selected locations.

The Information from existing reports had not been field reviewed by the Corps, was more than three years old, and was not available for the Attleboro or Rapid Bus alternatives. Therefore, the approximate size and cover type of each wetland used in the DEIS/DEIR impacts analysis for all alternatives was created from Geographic Information Systems (GIS) mapping that was further modified through review of features visible on aerial photographs and topographic maps. In addition, aerial photographs in conjunction with field verification were used for the proposed station sites, the Attleboro Bypass, and the Whittenton Secondary.

[7] MassGIS Data - DEP Wetlands (1:12,000).

During scoping, the U.S. Army Corps of Engineers' New England District used the Highway Methodology Workbook Supplement[8] to evaluate existing wetlands and their functions and values. This approach was specifically recommended by USEPA, and was adopted by the Corps as an initial screening tool for purposes of evaluating impacts to wetlands likely to result from the alternatives under consideration by MassDOT. During early stages of the Highway Methodology[9] a large number of alternatives may be under consideration and only limited field observations are made in order to screen out those that are obviously either not practicable or are clearly not the Least Environmentally Practicable Alternative (LEDPA). At this stage existing information is typically very general and wetland boundaries are defined as a composite of National Wetland Inventory as devised by Cowardin et al.,[10] and Natural Resource Conservation Service maps. Cover types according to the Cowardin system and key wetland functions and values can be derived from the literature, limited field investigations, or public input. Additional field work sufficient to satisfy the determination of the LEDPA is usually required. Wetland evaluation forms are generally completed and the data is presented graphically. After the LEDPA is determined, it is subjected to a three parameter delineation of the affected wetlands using the required Corps method and data sheets.

Existing Information

Extensive existing information for wetland resources along the right-of-way for the Stoughton Alternative and the Southern Triangle was available from information filed in the 1999 Draft EIR, the 2002 Final EIR, and Abbreviated Notices of Resource Area Delineation (ANRADs) filed with the local conservation commissions in the study area.

In the 2002 Final EIR, all Bordering Vegetated Wetlands (BVW) and Bank within or adjacent to the right-of-way were delineated for The Stoughton Alternative. The Conservation Commissions of Canton, Stoughton, Easton, Raynham, and Taunton reviewed ANRADs submitted for the wetland resource areas that occur within their communities. Canton, Stoughton, Raynham, and Taunton approved the limit of resource areas defined in the ANRADs submitted to the Commissions, while the Easton ANRAD was reviewed and approved by the Department of Environmental Protection (DEP) Southeast Regional office. ANRADs were also submitted to the remaining towns and cities for The Stoughton Alternative; however the review was not completed. The information available through these past filings includes wetland cover type, approximate size, and field-delineated wetland boundaries. Wetland boundaries were flagged between 1997 and 2001 and represent the limit of wetland resources that were present at that time. This information combined with the modified GIS layer (described below) provided the starting point for the wetland information presented in the figures included in the DEIS/DEIR.

GIS Mapping

The MassGIS DEP Wetlands layer, last updated in April 2007, provided an underlying data set for defining wetland resources for each of the analytical approaches. This layer provided approximate location, general vegetation cover type, and size of wetland resources, including hydrologic connections

[8] USACE. 1999. *The Highway Methodology Workbook Supplement, Wetland Functions and Values - a Descriptive Approach*. New England District, U.S. Army Corps of Engineers, NAEEP-360-1-30a. Concord, MA.

[9] USACE. 1993. *The Highway Methodology Workbook. Integrating Corps Section 404 Permit Requirements with the NEPA EIS Process.* New England District, U.S. Army Corps of Engineers, NEDEP-360-1-30. Concord, MA.

[10] Cowardin, L.M., V. Carter V., F.C. Golet, E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service Report No. FWS/OBS/-79/31.Washington, D.C.

and stream characteristics. Information contained in this layer was interpreted from 1:12,000 scale, stereo color-infrared (CIR) photography by staff at the University of Massachusetts (UMASS), Amherst.

Wetland resources along the right-of-way were initially identified using this data layer. Upon closer examination of the individual wetland polygons, it became apparent through visible features shown on aerial photographs that portions of the individual wetland polygons were not accurate and required modification. Once the wetlands layer was brought into the ESRI ArcMap 9.2 and 9.3 GIS program, aerial photographs obtained through Microsoft Livesearch® were used in conjunction with USGS topographic maps to identify existing polygons that required modification. Further correction and assessment of wetland boundaries was made using the Microsoft Livesearch® bird's-eye view tool, which provides oblique aerial images at varying degrees of resolution. Clear continuation of cover types observed through aerial photographs, instances of open water, visible depressions, and elevation lines were used as a basis to modify polygons to create a more accurate wetlands layer. To the extent possible, cover types were also verified during this process.

Each right-of-way was evaluated for the presence of BLSF through GIS mapping. Federal Emergency Management Agency (FEMA) floodplain maps were used in conjunction with the modified DEP Wetland layers to determine where the 100-year floodplain extended past the boundary of Bank and BVW. BLSF was assumed to occur in such instances.

Riverfront Area was evaluated where the USGS 7.5 Minute map showed a perennial stream crossing the right-of-way. Bank could not be accurately delineated at this scale of resolution.

Due to the limitations of this methodology, no ILSF or non-state federal wetlands were identified using this approach. Wetlands within or adjacent to the right-of-way for the Stoughton and Whittenton Alternatives (Electric and Diesel) were delineated in accordance with the Corps of Engineers Wetlands Delineation Manual, as updated. However, wetland inspections were not able to be performed along the Attleboro Secondary Line, an active rail line, extends from Whittenton Junction to Weir Junction. The majority of this section of track (approximately 1.7 miles) is a densely developed area between Danforth Street and Weir Junction. The remaining stretch of tracks between Whittenton Junction and Danforth Street (approximately 0.7 mile) was assessed using available information.

Mapped vernal pools consist of certified vernal pools and potential vernal pools as identified in the 2010 Natural Heritage and Endangered Species Program (NHESP) Natural Heritage Atlas as well as vernal pools that were field verified for the South Coast Rail project. Additional information on vernal pools can be found in Chapter 4.14, *Biodiversity, Wildlife and Vegetation*.

A review of the 2010 Edition of the Massachusetts NHESP Natural Heritage Atlas was performed to identify areas where the South Coast Rail alternatives cross Estimated Habitats of Rare Wildlife. The Estimated Habitats of Rare Wildlife polygons are based on occurrences of rare wetland wildlife observed within the last 25 years and documented in the NHESP database. They do not include those areas delineated for rare plants or for rare wildlife with strictly upland habitat requirements. Wetland resources within these Estimated Habitat polygons were identified using NHESP GIS data available through MassGIS. Additional information on Estimated Habitat of Rare Wildlife can be found in Chapter 4.15, *Threatened and Endangered Species*.

Field Verification

Field verification was used in areas where aerial photographs and topographic maps provided inconclusive results. This approach was also used at station sites where wetland boundaries were required for site and station building design. Field verification was also required along the Whittenton Secondary segment of the Stoughton Line (Whittenton Alternative) because examination of aerial photographs in this area did not provide sufficient information for wetland polygon modification.

Field verification of these areas was performed using a Tablet PC GPS system that displayed aerial photographs and the MassGIS DEP Wetlands layer. Approximate wetland boundaries were walked at each of the sites and either sketched onto a plan or marked using GPS. The DEP Wetland polygons were then modified using the information collected in the field. Cover types were also verified in the field and modified as needed. Preliminary assessment of cover type was made using the classification systems presented in the MassGIS data. Cowardin classifications of wetland areas were made based on these cover types. This process was performed at station sites where prior field delineated information was not available.

Ditches along the right-of-way required a different approach in interpreting their presence and how to properly regulate them. Ditches can be regulated as an isolated wetland, ILSF, BVW, or Bank depending on their characteristics and whether or not they connect two or more waters of the United States. It should be noted that ditches excavated on dry land (i.e., in uplands) solely for the purpose of draining such infrastructure as highways and railroad lines are generally not considered waters of the United States. Ditches along alternatives for which detailed information existed were described as such. Ditches were difficult to accurately represent for the alternatives which only used GIS interpretation, as the aerial photography did not possess sufficient detail. Ditches along the Stoughton Alternative and the Southern Triangle rail rights-of-way were field verified and brought into the DEP Wetlands layer as they were observed in the field.

4.16.4.2 Federal Delineation Procedures

A more refined identification of wetland resource areas was conducting following publication of the DEIS/DEIR. This section describes both federal and state procedures for delineating wetland resource areas, and defines those resource areas.

Wetland resource areas in the project right-of-way are federally regulated under Section 404 of the Clean Water Act.[11]

The methods in the 1987 Corps of Engineers Wetland Delineation Manual (1987 Corps Manual) require that three criteria ("diagnostic environmental characteristics") be met for an area to be classified as a jurisdictional wetland: dominance of hydrophytic vegetation, presence of hydric soils, and evidence of wetland hydrology.

In 2009, the USACE issued Regional Supplements to the 1987 Corps Manual; final versions of the supplements were issued in 2012. Massachusetts falls into the Northcentral and Northeast Region.[12] The

[11] 33 USC §1344 – Permits for Dredged or Fill Material. http://www.law.cornell.edu/uscode/text/33/1344, accessed May 30, 2012.

[12] U.S. Army Corps of Engineers. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (ERDC/EL TR-12-1)*. Vicksburg Mississippi, U.S. Army Engineer Research and Development Center.

purpose of the Regional Supplement is to “address regional wetland characteristics and improve the accuracy and efficiency of wetland-delineation procedures.” The Regional Supplement provides a number of revised and refined defining characteristics and methods to be used to identify wetlands in the field, in order to increase the regional sensitivity of wetland delineation in the Northcentral and Northeast Region.

Although the Regional Supplement states that the determination of jurisdiction for a given wetland is still subject to Section 404 of the Clean Water Act, it also provides information to replace sections of the 1987 Corps Manual, and states: “*Where differences in the two documents occur, this Regional Supplement takes precedence over the Corps Manual for applications in the Northcentral and Northeast Region*.”

Hydrophytic Vegetation

According to the 1987 Corps Manual, the prevalent vegetation in jurisdictional wetlands consists of macrophytes that are typically adapted to areas having the hydrologic and soil conditions that are described in the Manual’s definition of wetlands. Hydrophytic species, due to morphological, physiological, and/or reproductive adaptations, have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions. Plant species have been compiled in a list[13] and are given a wetland indicator status to denote the hydrologic regime in which they are most often found. The indicator status can be Obligate (OBL), Facultative Wet (FACW), Facultative (FAC), Facultative Upland (FACU), or Upland (UPL). The use of (+) and (–) modifiers further refine those categories, with (+) designating a preference for a wetter regime and (-) a drier regime. According to the 1987 Corps Manual, a plant with a status of FAC or wetter is considered to be a wetland plant, while a plant with a status of FAC-or drier is considered to be a non-wetland plant. The 1987 Corps Manual makes note of the fact that some plant species have broad ecological tolerances and occur in both wetlands and non-wetlands.

The 2012 Northcentral/Northeast Regional Supplement provides guidance on vegetation sampling and analysis to supplement the 1987 Corps Manual, including more precise definitions of plant strata and field techniques than are found in the 1987 Corps Manual. Of particular note, the Regional Supplement alters the usage of indicator status for a given plant species by removing the usage of (+) and (–) modifiers. Therefore, any plant with an indicator status of FAC-, which would have previously been considered a non-wetland plant, is now grouped with all other plants with an indicator status of FAC, making these wetland plants. As of June 1, 2012, the National Wetland Plant list has been updated to reflect these changes.[14]

Hydric Soils

The 1987 Corps Manual defines a hydric soil as “*a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation.*” The 1987 Corps Manual describes several characteristics and features that are

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[13] Reed, P. B., Jr. 1988. *National list of plant species that occur in wetlands: 1988 national summary.* Biological Report 88(24). Washington, DC: U.S. Fish and Wildlife Service.

[14] Lichvar, R.W. and J.T. Kartesz. 2009. North American Digital Flora: National Wetland Plant List, version 2.4.0. U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC. https://wetland_plants.usace.army.mil, accessed June 29, 2012.

used to identify soils as hydric, such as the presence of layers of organic material, reducing (low oxygen) soil conditions, and soil colors that result from prolonged saturation and/or inundation.

The Regional Supplement presents indicators that are designed to help identify hydric soils in the Northcentral and Northeast Region, along with accompanying photographs and identifying criteria. The Regional Supplement does not change the core definition of a hydric soil in the 1987 Corps Manual, and notes that: “Indicators are not intended to replace or relieve the requirements contained in the definition of a hydric soil. Therefore, a soil that meets the definition of a hydric soil is hydric whether or not it exhibits indicators.”

Hydrology

The 1987 Corps Manual establishes criteria to identify wetland hydrology: “*Areas with evident characteristics of wetland hydrology are those where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic and reducing conditions, respectively. Such characteristics are usually present in areas that are inundated or have soils that are saturated to the surface for sufficient duration to develop hydric soils and support vegetation typically adapted for life in periodically anaerobic soil conditions.*” The 1987 Corps Manual provides a number of identifying factors that are used in the field to determine the hydrology of an area, including direct observation of inundation, soil saturation, and evident drainage patterns.

The Regional Supplement presents indicators that are designed to help identify wetland hydrology in the Northcentral and Northeast, along with accompanying photographs and identifying criteria. According to the Regional Supplement, wetland hydrology indicators “provide evidence that the site has a *continuing* wetland hydrologic regime and that hydric soils and hydrophytic vegetation are not relicts of a past hydrologic regime.”

Guidance Memorandum

In 2007, the USACE and the USEPA issued a joint guidance memorandum on Clean Water Act Jurisdiction following the U.S. Supreme Court’s decision in *Rapanos v. United States* & *Carabell v. United States.*[15] The memorandum was revised after public comment and the final document was issued on December 2, 2008. The memorandum provided guidance to USEPA regions and Corps districts, particularly in regards to situations in which the agencies should apply the “significant nexus” determination to determine whether or not to take jurisdiction over an area.

In accordance with the guidance document, all of the wetlands and waterways identified and delineated for the South Coast Rail project are considered jurisdictional because they are either:

- Traditional navigable waters;
- Wetlands adjacent to traditional navigable waters
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months); or

[15] U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency, Clean Water Act Jurisdiction Following the U.S. Supreme Court’s Decision in Rapanos v. United States &Carabell v. United States, June 6, 2007, revised December 2, 2008.

- Wetlands that directly abut such tributaries.

Additional guidance concerning Corps jurisdiction is found in the Corps' Regulatory Guidance Letter 08-02 (Jurisdictional Determinations).[16] RGL 08-02 stipulates that an applicant may elect to use a preliminary jurisdictional determination to voluntarily waive or set aside questions of jurisdiction over a particular site or resource area. A landowner, permit applicant, or other "affected party" may elect to use a preliminary JD even where initial indications are that the water bodies or wetlands on a site may not be jurisdictional. Although some small wetlands within or along the right-of-way are "isolated" – i.e., they do not directly touch or abut any traditional navigable waters (or tributaries thereto) – at this time MassDOT is not asserting that these wetlands do not have a significant nexus to a traditional navigable water. Therefore MassDOT has voluntarily elected to assume that these wetlands are jurisdictional waters of the United States. However, any areas characterized as "swales or erosional features," which do not flow through or out of another jurisdictional resource area, or which are "excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water," are not jurisdictional according to the joint guidance memorandum, and have not been delineated as wetland resource areas. These include former or current railroad drainage ditches excavated in uplands.

The Corps prepared a Preliminary Jurisdictional Determination for the proposed Stoughton and Whittenton railroad rights-of-way on February 4, 2013. A total of 73.0 acres of waters, including 70.2 acres of wetlands and 2.8 acres of other waters, were determined to be present within the existing railroad rights-of-way, plus at proposed railroad station locations. For purposes of this preliminary jurisdictional determination, any waterway that was found to contain wetlands in part is considered to be wetlands (and therefore a "special aquatic site" as defined by USEPA regulations at 40 CFR 230, Subpart E), in entirety. The preliminary jurisdictional determination was accepted and signed by MassDOT on February 19, 2013 and is attached to this FEIS as Appendix 4.16-A.

4.16.4.3 State Delineation Procedures

Wetland resource areas in the South Coast Rail project right-of-way are state regulated under the WPA.[17] Delineation of BVW resource areas under Massachusetts wetland regulations are addressed in a 1995 state handbook *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act: A Handbook* (1995 State Handbook).[18] The 1995 State Handbook identifies wetlands as: "areas where groundwater is at or near the surface, or where surface water frequently collects for a significant part of the growing season, and where a significant part of the vegetative community is made up of plants adapted to life in saturated soil." The 1995 State Handbook also identifies the two characteristics that determine state jurisdictional wetlands: "Hydrology (water) and vegetation (plants) are the two characteristics that define freshwater wetlands protected by the Act." These characteristics are discussed below.

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[16] U.S. Army Corps of Engineers Regulatory Guidance Letter 08-02: Jurisdictional Determinations. 26 June 2008, http://www.usace.army.mil/Portals/2/docs/civilworks/RGLS/rgl08-02.pdf (April 18, 2013).

[17] Massachusetts General Laws, Chapter 131, Section 40. Available online at: http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleXIX/Chapter131/Section40, accessed May 30, 2012.

[18] Jackson, S. 1995. *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act: A Handbook*. Massachusetts Department of Environmental Protection, Division of Wetlands and Waterways.

Vegetation

The 1995 State Handbook refers to the same list of plants and their wetland indicator status as the 1987 Corps Manual, noting that plants with a rating of FAC or wetter are considered wetland indicator plants. The 1995 State Handbook also references plant species listed in the WPA and plants that exhibit morphological or physiological adaptations to life in saturated or inundated conditions as wetland indicator plants.

Hydrology

The 1995 State Handbook includes hydric soil characteristics as an indicator of wetland hydrology. Therefore, if an area has a dominance of wetland vegetation and exhibits hydric soil characteristics, it is considered to be a wetland. Areas that do not exhibit hydric soil characteristics, but that have a dominance of wetland vegetation as well as other indicators of hydrology, may also be considered wetlands. These other indicators of hydrology include evidence of surface water, evidence of soil saturation, and morphological plant adaptations.

Comparison of Federal and State Delineation Methods

The 1987 Corps Manual names three distinct criteria of hydrophytic vegetation, hydric soils, and hydrology that must all be satisfied for an area to be considered a wetland resource area. The 1995 State Manual names only the two criteria of vegetation and hydrology, and includes hydric soils as a sign of hydrology. In addition, small isolated wetlands are not considered jurisdictional under state delineation methods, while these areas may be jurisdictional under federal delineation methods if they have a “significant nexus” to a bordering vegetated wetland.[19] MassDOT has assumed that all isolated wetlands along the South Coast Rail project corridor are federally jurisdictional.

Vegetated wetland resource areas along the Stoughton alternative and Whittenton Branch were delineated with respect to both methodologies. Any areas that exhibited hydrophytic vegetation, hydric soils, and hydrology were flagged as wetland resource areas under both state and federal jurisdiction. Small isolated areas were also flagged and were noted as being under federal jurisdiction only.

4.16.5 Delineation Methods and Procedures

In order to identify and delineate the jurisdictional wetland resource areas within the South Coast Rail project corridor, field surveys were conducted along the entire length of the right-of-way. This effort involved field work in all ten municipalities along the length of the project corridor.

The initial wetland review work done for the 2009 DEIS/DEIR provided a body of knowledge and a series of figures on which to base the field work. Wetland resource areas along the Stoughton Alternative were field delineated in 2002 for the original FEIR, and this information was also referenced for the 2010 field delineations. Wetland resource areas were also delineated along the Whittenton Branch, and impacts to these wetland resource areas were calculated for both state and federal resource area types as well as by cover type. Wetlands along the Attleboro Secondary associated with the Whittenton alternative could not be field inspected due to lack of access, but the majority of the Attleboro Secondary runs through developed areas of Taunton.

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[19] U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency, Clean Water Act Jurisdiction Following the U.S. Supreme Court’s Decision in Rapanos v. United States & Carabell v. United States, June 6, 2007, revised December 2, 2008.

4.16.5.1 Delineation Criteria for Vegetated Wetlands

Vegetated wetlands and waterways were identified and delineated using the methods and criteria established in the 1987 Corps Manual and the 2012 Northcentral-Northeast Regional Supplement, as well as the 1995 State Manual. Potential wetland resource areas were examined by field investigators using these criteria all along the South Coast Rail project corridor. To document conditions in each identified wetland resource area, a representative observation point was selected, and field data sheets were completed describing the upland and wetland characteristics of the observation point.

Wetland areas were delineated in the field between March 2010 and August 2010. Wherever wetland resource areas occurred, points to designate the boundaries were marked with colored flagging. Points were also located with a Trimble® Model [No] hand-held GPS device.

Hydrophytic Vegetation

Visual estimates of species abundance were made for the upland and wetland plant communities at each observation point, and the dominant species were determined and recorded by genus and species on field data sheets. Dominant species were determined separately for each vegetative stratum as trees, saplings/shrubs, herbs, and vines.

The wetland indicator status of each species was determined according to the 1988 *National List of Plant Species That Occur in Wetlands: Region 1, Northeast*, which is based on the national list[20] According to the Regional Supplement, three separate procedures exist to determine whether an area has hydrophytic vegetation: the rapid test for hydrophytic vegetation, the dominance test, and the prevalence index. These procedures are discussed in detail in the Regional Supplement. All three methods were considered when evaluating site conditions.

Soils

Baseline soils information was determined from review of existing data, including the USDA NRCS Soils Surveys of Bristol, Plymouth, and Norfolk/Suffolk counties of Massachusetts,[21] county and state lists of hydric soils, and data collected from the previous wetland delineations.

During wetland investigation, soils were examined with a hand auger to determine if hydric soil characteristics were present. Auger holes were excavated to a depth that confirmed the presence of hydric soils in wetland areas, or that eliminated the possibility of hydric soils in uplands. Instances of auger refusal often occurred at a depth of only a few inches due to the subsurface conditions of the large disturbance area associated with existing railroad beds. The colors of the soil matrix and any redoximorphic features were described using Munsell® Soil Color Charts. Information describing the upland and wetland soil profiles was recorded on the field data sheets for each identified wetland.

Hydrology

Site hydrology was determined in the field based on properties such as soil saturation, inundation, oxidized root zones, manganese concretions, drainage patterns, and proximity to a perennial waterway.

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[20] Reed, P. B., Jr. 1988. *National list of plant species that occur in wetlands: 1988 national summary.* Biological Report 88(24). Washington, DC: U.S. Fish and Wildlife Service.

[21] US Department of Agriculture, Natural Resource Conservation Service. Web Soil Survey. Available online at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm, accessed June 1, 2012.

Hydrologic indicators were based on the 1987 Corps Manual, the 2012 Northcentral-Northeast Regional Supplement, and the 1995 State Manual.

4.16.5.2 Delineation Criteria for Other Resource Areas

The following sections describe the criteria used to determine the boundaries of other resource areas.

Bank

Bank was delineated according to Massachusetts regulations (310 CMR 10.54) (Waterbodies were identified, including perennial and intermittent streams as well any ponds, and Bank flags were hung at the first observable break in the slope.

Land under Waterbodies and Waterways (LUW)

Land under Waterbodies and Waterways (LUW) was based on the delineation of Bank. In areas that contain a perennial stream or pond, LUW extends downgradient from Bank flags.

Bordering Land Subject to Flooding (BLSF)

Bordering Land Subject to Flooding (BLSF, (310 CMR 10.56) was not delineated in the field. The extent of this resource area is based off of published Federal Emergency Management Agency (FEMA) flood elevations, which estimate the elevations to which water would flood during a 100-year storm event[22]; any area below this elevation to the Bank of a corresponding WW or a Bordering Vegetated Wetland is BLSF. A measurement of BLSF is therefore a volume and not an area, and requires detailed topography of a given area in order to accurately measure. However, for BLSF, ILSF, and LSCSF, only the area of impact has been estimated, rather than the total volume of impact to these resource areas. Since detailed topography along the South Coast Rail project corridor does not exist, the volume of impact to these resource areas cannot be calculated with accuracy.

Isolated Land Subject to Flooding (ILSF)

As with BLSF, Isolated Land Subject to Flooding (ILSF, (310 CMR 10.57)) cannot be calculated for a given area with accuracy without more detailed topographic information than is currently available. ILSF areas were identified along the project corridor only when they were already known to be ILSF from previous plans, or when they were positively identified as ILSF by visual observation and estimation of their ability to hold one quarter-acre foot of water at an average depth of 6 inches.

Riverfront Area (RA)

Riverfront Area (RA, (310 CMR 10.58)) was not delineated in the field. Measurement of these resource areas is based on the delineation of Bank. In areas that contain a perennial stream or pond, RA extends upgradient from Bank flags.

Land Subject to Coastal Storm Flowage (LSCSF)

Land Subject to Coastal Storm Flowage (LSCSF) was not delineated in the field. See the discussion of BLSF for a description of how the area of LSCSF was estimated.

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[22] A "100-year storm event" has a 1 percent probability of occurring in any given year.

Coastal Bank

Coastal Bank was delineated according to Massachusetts regulations ((310 CMR 10.30). Coastal Waterbodies were identified, and Coastal Bank flags were hung on the seaward face at the landward edge of any elevated landform.

Once wetland resource areas had been delineated in the field, the coordinates of all BVW, IVW, Bank, and Coastal Bank flags were incorporated into CAD plot plans showing the track design for the project. These plans were generated for each municipality and showed the track, the limit of the right-of-way, any wetland resource areas that were delineated, and topography using 5-foot contours. Finally, areas of BLSF, RA, and LSCSF were generated on the plans.

4.16.5.3 Federal and Municipal Review

The USACE has reviewed and verified the delineated boundaries. In addition to federal review by the USACE, the Secretary's Certificate called for plans to be presented to each municipality as part of an ANRAD submission, to allow the Conservation Commission in each municipality to review the delineations. The materials in the ANRAD for each municipality included the plot plans as well as field data forms documenting the delineation for each wetland resource area.

In 2011, ANRADs were submitted to all ten municipalities through which the South Coast Rail project passes. In each municipality, the filing was reviewed by the Conservation Commission through a public hearing process. Several municipalities retained outside consultants to review the delineation. All ANRAD submissions were also submitted to the Massachusetts Department of Environmental Protection (MassDEP) for state review.

> Three municipalities (Stoughton, Easton, and Raynham) elected not to review BLSF or ILSF because the 5-foot topographic contours on the plot plans were not sufficiently accurate enough to allow for a precise delineation of these resource areas. Since a full topographic survey at 1-foot contour intervals is outside the current scope of the South Coast Rail project, these areas were withdrawn from the ANRAD submissions in these municipalities.

Table 4.16-2 contains a summary of the municipalities in which ANRADs were filed, the file number issued by MassDEP for each ANRAD, the date any Order of Resource Area Delineation (ORAD) was issued, and whether any resource areas were excluded from the ORAD.

Table 4.16-2 Summary of ANRAD Reviews

Municipality	MassDEP File Number	Date ANRAD Submitted	Date ORAD Issued	Resource Areas Excluded from ORAD
Canton	SE 124-1083	October 2011	April 2012	none
Stoughton	SE 298-0709	October 2011	June 2012	BLSF, ILSF
Easton	SE 152-1349	October 2011	August 2012[1]	BLSF, ILSF
Raynham	SE 269-0880	November 2011	August 2012	BLSF, ILSF
Taunton	SE 073-2472	May 2011	August 2011	Wetlands along CSX-controlled track (lack of access)
Berkley	SE 004-0512	April 2011	June 2011	none
Lakeville	SE 192-0642	April 2011	February 2012	none
Freetown	SE 026-0510	June 2011	January 2012	Freetown Station
New Bedford	SE 049-0664	April 2011	July 2011	none
Fall River	SE 024-0614	May 2011	July 2011	none

1 Easton issued an ORAD rejecting the delineation on April 11, 2012; this filing was appealed with MassDEP and a Superseding ORAD was issued on August 29, 2012.

4.16.6 Wetland Functions, Values, and Significant Interests

Wetlands, watercourses, and water bodies may provide a variety of functions and values, such as wildlife habitat, fish habitat, visual/aesthetic quality, water-based recreation, flood storage and storm damage prevention, groundwater and surface water quality and quantity, pollutant attenuation through nutrient retention and sediment trapping, shoreline stabilization, and dissipation of erosive forces. Ecological functions and societal values vary with each wetland. Factors affecting wetland function include size, location in the watershed, number and interspersion of plant cover types, and the degree of disturbance.

The WPA regulations list eight functions and values, defined as significant interests, provided by wetland resource areas. These are:

- Protection of public and private water supply;
- Protection of ground water supply;
- Flood control;
- Storm damage prevention;
- Prevention of pollution;
- Protection of land containing shellfish;
- Protection of fisheries; and
- Protection of wildlife habitat.

The regulations presume that each wetland resource area is significant to some or all of these interests. These presumptions are rebuttable under the regulations in cases where the resource area has been altered by development or other human activities.

Table 4.16-3 summarizes the regulatory presumptions for each state-regulated inland wetland resource area.

Table 4.16-3 State Wetland Resource Area Presumptions of Significance

	LUW	Bank	BVW	BLSF[1]	ILSF[2]	Riverfront Area[3]	Coastal Bank
Public and Private Water Supply	x	x	x	-	x[2]	x	-
Ground Water Supply	x	x	x	-	x[2]	x	-
Flood Control	x	x	x	x	x	x	-
Storm Damage Prevention	x	x	x	x	x	x	x
Prevention of Pollution	x	x	x	-	x	x	x
Fisheries	x	x	x	-	-	x	-
Land Containing Shellfish	-	-	-	-	-	x	-
Wildlife Habitat	x	x	x	x	x	x	-

1 Only those areas within the 10-year floodplain, or within 100 feet of bank or BVW (provided those areas are within the 100-year floodplain) and all vernal pool habitat within the 100-year floodplain, except for those portions which have been so extensively altered that their important wildlife habitat functions have been eliminated.

2 ILSF is presumed significant to Public and Private Water Supply and Ground Water Supply when underlain by pervious material. When it is underlain by organic material it is presumed significant to Prevention of Pollution. Vernal Pool habitat within ILSF is significant to Wildlife Habitat.

3 Riverfront Area is presumed significant to the protection of Land Containing Shellfish only when associated with coastal waterbodies.

BVWs are federally regulated under Section 404. There are also several wetlands adjacent to or within the project alternatives corridors that meet the regulatory criteria for wetlands under Section 404 of the Federal Clean Water Act because they are dominated by wetland plants and have hydric soils.

The Army Corps of Engineers New England District method for assessing wetland functions and values [23] was employed for the South Coast Rail project. The methodology considers eight wetland functions and five wetland values in a Section 404 permit application:

Wetland Functions:

- Floodflow Alteration;
- Fish and Shellfish Habitat (Aquatic Diversity/Abundance);
- Sediment/Toxicant Retention (Pollutant Attenuation);

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[23] USACE. 1999. *The Highway Methodology Workbook Supplement, Wetland Functions and Values - a Descriptive Approach*. New England District, U.S. Army Corps of Engineers, NAEEP-360-1-30a. Concord, MA.

- Nutrient Removal/ Retention/Transformation (Pollutant Attenuation);
- Production Export (Nutrient);
- Wildlife Habitat;
- Uniqueness/Heritage; and
- Recreation (Consumptive/Non-Consumptive).

Wetland Values:

- Groundwater Recharge/Discharge
- Sediment/Shoreline Stabilization
- Educational/Scientific Value
- Visual Quality/Aesthetics
- Threatened or Endangered Species Habitat

Floodflow Alteration (Storage/Desynchronization)

Wetlands can be important in the storage and desynchronization of floodwaters, protecting downstream resources from flood damage. Wetlands high in the watershed with constricted outlets or closed basins are generally important in capturing and detaining floodwaters. Other wetland characteristics that contribute to flood storage and desynchronization include broad floodplains and plant communities consisting of low, dense vegetation.

Study area wetlands designated as having floodflow desynchronization functions are identified by considering the local topography (broad, relatively flat areas), size, presence of ponded water, contiguous/branched channels, well vegetated floodplains along rivers and larger streams, and position in the landscape. The location of culverted streams within the right-of-way provides a means for retaining floodwaters higher in the watershed.

Fish and Shellfish Habitat (Aquatic Diversity/Abundance)

Large wetlands contiguous to a large, perennial stream or waterbody capable of supporting large fish and/or shellfish populations are important in providing Aquatic Diversity/Abundance. Other wetland characteristics that contribute to Aquatic Diversity/Abundance include good water quality, an abundance of shoreline vegetation, objects or vegetation that provide cover, spawning areas such as beds of submerged aquatic vegetation or gravel beds, and the lack of barriers such as dams and waterfalls, which prevent fish movement.

Sediment/Toxicant Retention (Pollutant Attenuation)

Wetland basins with permeable soils that detain storm and flood waters and promote percolation reduce runoff rates sufficiently to allow sediments and the adsorbed toxicants to settle from the water column. Diffuse channels, deep pools, and dense low vegetation are wetland characteristics that may also contribute to this process by slowing water velocities.

Nutrient Removal/Retention/Transformation (Pollutant Attenuation)

Wetlands can serve as a filter for the removal or detention of nutrients carried in surface water flows. Many wetland plants respond to high nutrient concentrations with accelerated rates. Some nutrients are assimilated in plant material while others are trapped in organic sediments in wetlands by chemical, physical, and biotic actions.

Study area wetlands designated as having nutrient removal functions are identified by the presence of large areas of open or ponded water with dense emergent vegetation, meandering streams with slow water velocities (supporting aggradations), and contiguous/branched channels.

Production Export (Nutrient)

Production export is the production of organic material and its subsequent transport out of a wetland to downstream areas or to deeper waters within the basin. This organic material is then added to the food chain where it is eaten by fish and other aquatic organisms. Wetlands with dense vegetation dominated by non-persistent emergent vegetation are important in supplying downstream wetlands with organic material. Wetlands dominated by shallow marshes with a perennial stream flowing from them are most important in providing production export.

Wetlands designated as having production export functions are classified by the presence of high densities and diversity of hydrophytic vegetation, presence of abundant fish and wildlife and downstream/downgradient evidence of export.

Wildlife Habitat

Large, undisturbed wetlands greater than 1 acre are generally considered to provide important wildlife habitat functions. Other factors that contribute to the provision of important wildlife habitat include the presence of shallow, permanent open water of good quality; proximity to undisturbed upland wildlife habitat; a high degree of interspersion of vegetation classes; a high degree of species and structural diversity within the vegetational community; high vegetation density; and the presence of wildlife food plants. Wetlands that are contiguous to other wetland areas may serve as travel or migratory corridors for wetland wildlife. Presence of vernal pools (ephemeral bodies of water that lack fish populations) connote a high wildlife value because several wildlife species, in addition to the obligate vernal pool species such as wood frog (*Rana sylvatica*) and ambystomid salamanders (*Ambystoma* spp.), use vernal pools and the areas immediately adjacent for feeding, cover, courtship, and overwintering habitat.

Size, adjacent land use, water quality, and presence of vernal pools are used to classify wetlands as important wildlife habitat for waterfowl, reptiles and amphibians, terrestrial bird species, and mammals.

Uniqueness/Heritage

The Uniqueness/Heritage function includes considerations of science, the endangerment of the wetland, and the importance of the wetland in the context of its local and regional environment. The wetland may contain areas of archaeological, historical, or social significance, or it may represent the last fragment of its wetland type in an urbanized or agricultural environment. The presence of relatively scarce wetland habitats or wetland species contributes to the Uniqueness/Heritage function provided by the wetland. Areas containing Estimated Habitats of Rare Wildlife (Estimated Habitat) or Priority Habitats of Rare Species (Priority Habitat) mapped by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) confer a higher value in this category.

Recreation (Consumptive/Non-Consumptive)

Wetlands designated as having Recreational value are classified based on the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting and other recreational activities. Consumptive opportunities, such as fishing and hunting, consume or diminish the plants, animals, or other resources that are intrinsic to the wetland. Non-consumptive opportunities do not diminish these resources of the wetland.

4.16.7 Impact Assessment Methodology

4.16.7.1 Quantification of Direct Impacts

As required by the National Environmental Policy Act (NEPA) Council on Environmental Quality (CEQ) regulations,[24] the analysis of the environmental consequences requires discussion of the direct and indirect effects of a proposed action, and their significance. Direct effects are defined as those "which are caused by the action and occur at the same time and place."[25] Indirect effects are defined as those "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."[26] These types of indirect effects are further discussed in Chapter 5, *Indirect Effects and Cumulative Impacts*.

The Massachusetts Environmental Policy Act (MEPA) requires "a detailed description and assessment of the negative and positive potential environmental impacts of the alternatives. The EIR [Environmental Impact Report] shall assess (in quantitative terms, to the maximum extent practicable) the direct and indirect potential environmental impacts from the Project that are within the Scope. The assessment shall include both short-term and long-term impacts for all phases of the Project (e.g., acquisition, development, and operation) and cumulative impacts of the Project, any other Projects, and other work or activity in the immediate surroundings and region."[27] Cumulative impacts are discussed in Chapter 5, *Indirect Effects and Cumulative Impacts*.

Direct wetland impacts, both temporary and permanent, are anticipated along each of the proposed alternatives. Each alternative corridor was assessed for the presence of wetland resources within and adjacent to the right-of-way, and the impacts associated with them. Permanent impacts are the loss of a wetland resource area following construction. Permanent impacts may result from, but are not limited to, wetland fill, dredging, and watercourse relocation or alteration.

Temporary impacts that may occur along the right-of-way include work areas adjacent to the alignment, placing erosion control devices including hay bales and silt fences, vegetation removal, and any indirect impact that could result from the migration of exposed soils. Examples of temporary impacts include short-term disturbances to wetlands and waterways during construction that would cease once construction activities are complete. These may include, but are not limited to, installing erosion

[24] Code of Federal Regulations (CFR), Title 40: Protection of the Environment, Part 1502- Environmental Impact Statement, Section 1502.16 Environmental Consequences (40 CFR 1502.16).

[25] 40 CFR 1508.8(a).

[26] 40 CFR 1508.8(b).

[27] 301 Code of Massachusetts Regulations, Title 11.00: MEPA Regulations. Section 11.07- EIR Preparation and Filing, (6) Form and Content of EIR, (h) Assessment of Impacts. (11 CMR 11.07(6)(h)).

controls, establishing work areas, or installing temporary structures at stream crossings. Section 4.16.9.4, *Temporary Construction-Period Impacts*, discusses these in greater detail and describes how these impacts would be mitigated.

As described in the Existing Conditions section, each impacted wetland along the proposed alternatives was also evaluated for its functions and values as well as the ability of each wetland to protect the interests of the Act. The evaluation was based on eight functions and five values as described and outlined by the United States Army Corps of Engineers, New England District.[28] The wetlands were evaluated using GIS data layers, orthophotos, and visual inspections of critical areas. Functions and values of impacted wetlands are shown on the figures illustrating each rail and roadway segment. These graphics show the functions and values, cover type, and total area of permanent loss for each impacted wetland. This information is presented in the large (1.75 x 1.75-inch) boxes. Where a large wetland would be impacted in several locations, smaller (1 x 1.25-inch) boxes are shown for each localized area of impact. These boxes show the cover type and amount of wetland loss in a specific sub-area of a larger wetland. Detailed information is provided about the total area of each wetland, the amount of impacted area, and the impacted cover types.

Once the wetland resource areas had been delineated and the preliminary track layout was determined, direct impacts to wetland resource areas were quantified. The quantification of direct impacts was performed using CAD analysis of the layout of the track, all wetland resource areas, and the limit of disturbance of the project. The limit of disturbance represents the limit of permanent alteration associated with the South Coast Rail project.

Direct impacts were calculated as being either permanent or temporary. Permanent impacts are any direct impact (fill) to wetland resource areas that are within the limit of disturbance. These impacts include fill, retaining walls, and other disturbance and structures that will remain in place and permanently impact the wetland resource area. Permanent impacts were determined by calculating the areas of any portion of a wetland resource area inside the limit of disturbance.

Permanent impacts were calculated for all wetland resource areas: BVW, LUW, IVW, Bank, RA, BLSF, ILSF, and LSCSF. For BLSF, ILSF, and LSCSF, only the area of impact has been estimated, rather than the total volume of impact to these resource areas. Impacts to RA were calculated as those impacts to the area within 200 feet of a perennial waterway that would constitute new development of previously undeveloped land. Previously developed (impervious surface) areas were estimated by overlaying a MassGIS data layer of mapped developed areas over the project corridor. Areas of impact to RA outside these previously developed areas were calculated as new impact. Temporary and permanent impacts to Outstanding Resource Waters (ORWs) were determined by identifying BVWs that contained a vernal pool within 100 feet of the right-of-way. These determinations are conservative and included certified vernal pools (CVPs), potential vernal pools (PVPs), and vernal pools that have been field verified in support of the South Coast Rail project (SCR-VPs). Because vernal pool boundaries have not been field delineated, the limit of the BVW associated with the vernal pool was assumed to be the boundary of the vernal pool. Prior to final design, actual vernal pool boundaries would be field delineated to enable a more refined assessment of impact to ORWs. Additional information on potential impacts to vernal pools can be found in Chapter 4.14, *Biodiversity, Wildlife and Vegetation*. Fall Brook in Freetown and

[28] U.S. Army Corps of Engineers, New England District. 1999. *The Highway Methodology Workbook Supplement,* US Army Corps of Engineers, New England District Tech. Rept. NAEEP-360-1-30a, 32pp.

Black Brook in Easton are also listed as ORWs and impacts to these resources are included in the analysis.

Temporary impacts represent unavoidable disturbances to the wetland associated with constructing the project which will not impact the wetland longer than the period of construction. These impacts mainly arise from the necessity of crew and machinery to work beyond the limit of disturbance in order to construct slopes, retaining walls, and other portions of the project. The limit of temporary impacts was estimated by establishing an area 4 feet wide outside the limit of disturbance. Temporary impacts were calculated for BVW, LUW, and IVW because these areas are ecologically wetlands. Temporary impacts within state-jurisdictional wetland resource areas that are ecologically upland (BLSF, RA) were not calculated at this level of design.

4.16.7.2 Secondary and/or Indirect Impact Analysis Methodology

Secondary (indirect) effects are defined in USEPA Regulations at 40 CFR Part 230.11.[29] The USEPA regulations state that "Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material." Additionally, although not specifically addressing impacts to aquatic resources, the CEQ NEPA regulations at 40 CFR Part 1508.8[30] define indirect effects as "effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects many include related effects on air and water and other natural systems, including ecosystems".

Secondary and/or indirect impacts are therefore the consequences of an action's direct impacts. For example, while the direct impact of filling a wetland would be the loss of the filled wetland area and the functions and values provided by that specific area, the secondary and/or indirect impacts of that wetland fill would result from the associated changes to the overall size of the wetland, hydrology, cover type, species assemblage, or degree of habitat fragmentation. These types of impacts could adversely affect the ability of the wetland to provide functions and values, or could diminish the functions and values to a degree greater than would be attributed simply due to the loss of area. Isolated fragments of wetlands or waterways may have reduced habitat value, no longer provide viable fish or wildlife habitat or be so isolated that the wetland or waterway fragments are rendered inaccessible to many fish or other aquatic species.

Methodology and Criteria for Evaluation

MassDOT met with the South Coast Rail Interagency Coordinating Group (ICG) in 2012 to develop a methodology for evaluating secondary and/or indirect impacts to wetlands from the South Coast Rail project. The methodology was presented in a memorandum prepared by MassDOT that incorporated ICG comments (Appendix 4.16-B).

The assessment of secondary and/or indirect impacts focuses on wetlands within 100 feet of the right-of-way along the South Coast Rail project corridor. At the request of the ICG, MassDOT was asked to consider assessing additional secondary and/or indirect impacts more than 100 feet from the right-of-way. Based on a literature review and a solid understanding of the construction and operations

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[29] 40 CFR §230.11, Factual Determinations. Available on line at: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr230_main_02.tpl, accessed June 1, 2012.

[30] 40 CFR §1508.8, Effects. http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr1508_main_02.tpl, accessed June 1, 2012.

of the South Coast Rail corridor, in comparison to the road-effects of new road construction or an operating highway, MassDOT concluded that there is no scientific basis for considering the South Coast Rail project's "road effect zone" for impacts to aquatic resources to extend further than 100 feet from the right-of-way.

The methodology developed by MassDOT to assess secondary and/or indirect impacts is a stepwise process that first evaluates any direct impacts to a given wetland, and then assesses the result of those impacts on the functions and values that the wetland provides, using a checklist of potential effects developed by MassDOT. The checklist is based on "considerations and qualifiers" for each wetland function and value, based on those outlined in a document prepared by the USACE New England Division.[31] These considerations and qualifiers are identified as the principal characteristics that contribute to the ability of each wetland to provide the indicated function or value. If the direct wetland impact of the proposed action alters these characteristics, it is presumed to alter the ability of the wetland to continue to provide the associated function or value.

For this analysis, secondary and/or indirect impacts to wetlands and other Waters of the United States include the following effects that could be caused by the placement of fill within jurisdictional wetlands, but occur at a different location or time:

- Changes in wetland functions; or
- Changes in wetland physical/biological characteristics as a result of the direct impacts (loss of wetland).

The types of direct impacts and the secondary and/or indirect impacts that may result include:

- Filling a portion of a wetland (loss of)–reduction in wetland size, introducing human activity (noise, disturbance);
- Dredging a wetland/pond–change in hydrology, vegetation, habitat;
- Constructing a berm across a wetland–change in hydrology, fragmentation, introduction of disturbed non-wetland conditions, creation of new "edge", interrupt migratory routes;
- Installing a new culvert or changing existing culvert–alter water levels or flow patterns;
- Removing canopy or other vegetation–change light regimes, water temperature, plan community structure;
- Relocating a stream– change flow characteristics; or
- A new discharge of stormwater–alter water levels or flow patterns, or introduce sediments or nutrients.

[31] The Highway Methodology Workbook Supplement, Wetland Functions and Values - a Descriptive Approach. USACE NED, 1999.

Assessment of Secondary and/or Indirect Impacts

Secondary and/or indirect impacts to wetlands were assessed for each within 100 feet of the Stoughton and Whittenton Lines between Brock Street in Stoughton and the terminal stations of the New Bedford Main Line in New Bedford and the Fall River Secondary Fall River, based on the functions and values that the wetland provides and the type and extent of the direct wetland impact and/or work adjacent to the wetland that is the cause of the secondary and/or indirect impact. The steps of this process are:

- For each wetland, identify the type of direct impact:
- Loss of wetland area due to placement of fill
- New culvert
- Replacement of existing culvert

Other

- Direct discharge of untreated stormwater from a pollutant source
- For each wetland, identify the type of work occurring within 100 feet of the wetland:
- Improvement of existing freight or commuter rail tracks and increased train service
- Replacement of track infrastructure on out-of-service rail and addition of train service, and
- Evaluate secondary and/or indirect impacts based on function-specific considerations using the attached checklist.

The list of potential effects on functions and values is based on the "considerations and qualifiers" for each wetland function and value, as presented in the Corps' "*Highway Methodology Workbook Supplement – Wetland Functions and Values, a Descriptive Approach*" (September 1999). These characteristics are identified in the Workbook Supplement as the principal characteristics that contribute to the ability of each wetland to provide the indicated function or value. If the direct wetland impact of the proposed action altered these characteristics, it is presumed to alter the ability of the wetland to continue to provide these functions.

4.16.8 Existing Conditions

4.16.8.1 Overview

Major Watersheds

The South Coast Rail alternatives as presented in the DEIS/DEIR pass through several watersheds associated with southeastern Massachusetts. Watersheds have become an important measure of the overall health and the capacity of a region to handle both stormwater and pollutant loading. The alternatives proposed in the DEIS/DEIR (Figure 4.16-1) cross through the Boston Harbor Regional Watershed, the Taunton River Regional Watershed, the Charles River Regional Watershed, and the Buzzards Bay Regional Watershed and are characterized by highly populated and densely populated municipalities and sparsely developed rural areas.

Boston Harbor Regional Watershed

The Boston Harbor regional watershed receives water from approximately 293 square miles in the greater Boston area. It is made up of the Mystic River, Neponset River, Fore, Back, and Weir River watersheds and includes 45 municipalities.

Buzzards Bay Regional Watershed

The Buzzards Bay regional watershed receives water from approximately 432 square miles of land in southeastern Massachusetts. The watershed takes water from lakes, rivers, streams, wetlands and groundwater that eventually drain into Buzzards Bay. Buzzards Bay is approximately 228 square miles and offers important habitat features including salt marsh, eelgrass beds, and tidal flats. It includes at least part of 15 municipalities.

Charles River Regional Watershed

The Charles River regional watershed is comprised of approximately 308 square miles and is part of 35 municipalities. This watershed is centered on the Charles River and extends from Hopkinton east to Boston Harbor. The Charles River and, consequently, its watershed have gone through cleanup efforts over the past several years resulting in a healthier, more productive ecosystem that is able to support a greater diversity of flora and fauna.

Taunton River Regional Watershed

The Taunton River regional watershed is the second largest watershed in the state, and the largest that any proposed alternative would cross. The watershed consists of 562 square miles of land, with 94 square miles of wetlands. The Hockomock Swamp is part of this regional watershed.

Major Wetland Systems

Typical wetland resource areas within the study area consist of extensive red maple (*Acer rubrum*) swamps, Atlantic white cedar (*Chamaecyparis thyoides*) swamps, river systems with surrounding red maple swamp and shrub swamps, and small isolated wetlands. The majority of the red maple swamps (such as Hockomock Swamp) have a closed tree canopy dominated by red maple and an understory dominated by arrow-wood (*Viburnum dentatum*), silky dogwood (*Cornus amomum*), highbush blueberry (*Vaccinium corymbosum*), and sweet pepperbush (*Clethra alnifolia*). The Atlantic white cedar swamps, including portions of the Hockomock Swamp, Pine Swamp, Assonet Cedar Swamp, and Acushnet Cedar Swamp, have a closed tree canopy dominated by Atlantic white cedar and red maple with an understory dominated by highbush blueberry, arrow-wood, and sweet pepperbush.

The following sections describe the major wetland systems that are adjacent to or found within the alternatives corridors. These major wetland systems are shown in Figure 4.14-1.

Fowl Meadow and Ponkapoag Bog

The Fowl Meadow and Ponkapoag Bog ACEC covers approximately 8,350 acres in the metropolitan Boston area, including parts of Boston, Canton, Dedham, Milton, Norwood, Randolph, Sharon, and Westwood (Figure 4.14-2). The ACEC is fragmented by several transportation corridors, including I-95, I-93, Route 24, Route 138, Route 1, and other roadways. It also includes upland areas that are developed in commercial and residential land uses as well as undeveloped forested upland and farmland.

The central resource features of the Fowl Meadow and Ponkapoag Bog ACEC are the Neponset River and the Ponkapoag Pond and Bog. An 8-mile stretch of the Neponset River and its tributaries, the adjacent wetlands and floodplains, the associated aquifers and public water supplies, and the diverse habitats form the core resources of the Fowl Meadow area. Ponkapoag Bog and Pond and the associated natural communities and wildlife habitats form the core resources of the Ponkapoag Bog area. Historical and archaeological resources and the recreational and educational values of both areas support their overall importance to the people and communities of the area.

The Fowl Meadow area includes the largest wetland and floodplain areas in the Neponset River basin. There are several municipal public wells that provide water to the communities of Canton, Dedham, and Westwood. At least 13 state-listed rare species occur in the ACEC. The northern Fowl Meadow area and Ponkapoag Bog have been designated a National Environmental Study Area by the National Park Service. Approximately 2,330 acres of the ACEC are owned by DCR, and are managed as part of the Blue Hills Reservation.

The Northeast Corridor forms the eastern boundary of the ACEC between Neponset Street in Canton and I-95, and forms the western boundary of the ACEC southwest of the I-95/I-93 interchange. The Northeast Corridor passes through the ACEC north of I-95, where the rail line parallels the Neponset River.

Hockomock Swamp ACEC

The Hockomock Swamp ACEC and its associated wetlands and water bodies are described by the Massachusetts DCR as the largest vegetated freshwater wetland system in Massachusetts (Figure 4.14-2). The wetland system, which includes the Hockomock Swamp, the Dead Swamp, the Titicut Swamp, and the Little Cedar Swamps, serves as the headwaters of the Town River, a tributary of the Taunton River, and overlays a system of high and medium yield aquifers that supply public drinking water wells in Raynham and West Bridgewater. The Stoughton and Whittenton Alternatives pass through this area.

Pine Swamp

Pine Swamp is a 275-acre wetland system located in western Raynham that consists of several parcels that are owned by the Town of Raynham Conservation Commission. The Stoughton Alternative (Electric and Diesel) crosses a 1-mile segment of the swamp between King Phillip Street and East Brittania Street. This area consists of forested and marsh wetlands associated with Pine Swamp, an area that is located within mapped Estimated Habitat of several rare wetlands species and supports an Atlantic white cedar swamp community.

Although there are no trails or designated points of public entry, the former rail right-of-way is used by pedestrians, all-terrain vehicles, off-road motorbikes, and other vehicles. The Stoughton Line and the former railroad bed through the conservation area is owned by the Taunton Municipal Light Corporation (TMLC), and maintained as a utility corridor with an overhead power line. The TMLC periodically maintains the right-of-way by clearing vegetation on the right-of-way and in the adjacent wetland.

Assonet Cedar Swamp

The Assonet Cedar Swamp Wildlife Sanctuary is a 1,000-acre parcel of conservation land owned by Mass Audubon in Lakeville. The land is designated by the state for the preservation of habitat for several rare

species, including the Hessel's hairstreak butterfly (*Callophrys hesseli*). It is one the largest Atlantic white cedar swamps in the state. The New Bedford Main Line passes through this sanctuary.

Forge Pond

Forge Pond is an irregularly shaped surface waterbody located mainly on the southwestern side of the Fall River Secondary. The Forge Pond Dam (MA00800) is located on the south side of Forge Pond and is classified non-jurisdictional by the DCR. A wetland complex of trees, shrubs, and emergent vegetation exists between the pond's edge and the tracks in several areas, especially along the northern edge of the pond. In the northern area, the wetland complex borders the tracks for approximately 1,600 feet and includes BVW, Bank and BLSF.

Acushnet Cedar Swamp

The Acushnet Cedar Swamp State Reservation is an approximately 1,000-acre property located in New Bedford and Dartmouth, north of the New Bedford Airport. It is an outstanding example of an Atlantic white cedar swamp and provides habitat for state-listed rare wetlands wildlife and other state listed rare, endangered, or special concern species. This is one of eight cedar swamps in public ownership in Massachusetts, and has been designated by the U.S. Department of the Interior – National Park Service as a National Natural Landmark. The existing New Bedford Main Line, currently used for freight rail service, forms the eastern boundary of the State Reservation.

Three Mile River ACEC

The recently-designated Three Mile River Watershed ACEC covers approximately 14,275 acres in Dighton, Norton, and Taunton. The ACEC is fragmented by Route 140, a major transportation corridor, and several other major roadways. It includes substantial upland areas that are developed commercial and residential lands as well as undeveloped forested upland and farmland. The Attleboro Secondary passes through the Three Mile River Watershed ACEC from Barrowsville in Norton to Crane Avenue in Taunton. This ACEC provides habitat for at least seven species listed as rare, endangered, or of special concern by NHESP.

Canoe River Aquifer ACEC

The Canoe River Aquifer ACEC covers approximately 17,200 acres in Easton, Foxborough, Mansfield, Norton, Sharon, and Taunton. The associated areas within this ACEC include Snake River, Watson Pond, and Lake Sabbatia. The ACEC is fragmented by several major transportation corridors, including I-495, Route 123, Route 106, and other major roadways. It includes substantial upland areas that are developed commercial and residential lands as well as undeveloped forested upland and farmland. The Northeast Corridor forms the western boundary of the ACEC from Mohawk Street in Sharon to Oakland Street in Mansfield. This ACEC contains another good example of an Atlantic White Cedar swamp community.

4.16.8.2 Existing Conditions by Municipality

This section presents the results of the field delineations of wetland resource areas along the FEIS/FEIR South Coast Rail alternatives, including the station sites and layover facilities. The following sections describe the wetland resource areas present in each municipality along the project corridor. Each section includes a table listing the wetland resource areas, as confirmed by each municipality's Conservation Commission.

This report only addresses those resource areas that are either within or directly adjacent to the South Coast Rail project right-of-way, or within or directly adjacent to the area of proposed stations that could be directly affected by construction. Other wetlands exist within 100 feet of the right-of-way, and their approximate locations are shown in the figures that accompany Chapter 4, but they were not field delineated at this planning stage of the project because they would not be directly impacted.

Any wetlands that are designated as Outstanding Resource Waters (ORWs) have been highlighted in the tables below. Wetlands designated as ORWs include all vernal pool wetlands, regardless of their certification status. All vernal pools were designated as ORWs in this report because all vernal pools were assumed to be certified vernal pools when determining impacts. Vernal pools are discussed in detail in the Chapter 4.14, Biodiversity, Wildlife, and Vegetation*.*

Federal jurisdictional wetlands include the state-regulated Land Under a Waterbody/Waterway (LUW), Bordering Vegetated Wetlands (BVW), Isolated Land Subject to Flooding (ILSF), and well as other small Isolated Vegetated Wetlands (IVW) that are not subject to state jurisdiction.

Plans showing the locations of all delineated wetland resource areas are provided in Appendix 4.16-C.

Canton

The Canton segment of the Stoughton alternative is approximately 2.3 miles long and is an active commuter and freight service on the Stoughton Line. Ten wetlands are located along the right-of-way in Canton.

An ANRAD was submitted to the Canton Conservation Commission in September 2011. Wetlands in Canton are part of the Neponset River watershed, and are comprised of four individual wetland systems and four isolated federal wetlands. Forge Pond (Wetland CA 1) and Mill Brook (Wetland CA 2.1) are the two large wetland systems along this segment of right-of-way. Mill Brook, a perennial stream, is part of a larger wetland system that flows into Beaver Meadow Brook. Wetland CA 1 is a large wetland system just south of Canton Center that includes Forge Pond and its adjacent wetland.

Table 4.16-4 lists the wetlands delineated along the right-of-way in Canton and the resources associated with each wetland.

There are four isolated wetlands along this section of existing track (Wetlands CA B1, CA B, CA C, and CA D). These wetlands are small depressions that appear to contain water for limited periods and are vegetated by plant species known to occur in wetlands.

Table 4.16-4 Wetland Resource Areas–Canton

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
CA-A	PSS Large common reed (*Phragmites australis*) marsh. Connected to a larger wetland across Sherman Street	-	-	✓	-	-	-	-
CA-A9	PFO/PEM Large depression containing standing water. Connected to large forested wetland adjacent to the railroad spur (offsite)	-	-	✓	-	-	-	-
CA-B1	PEM Emergent wetland with pockets of standing water	-	-	-	✓	-	-	-
CA-B	PSS Small scrub-shrub wetland	-	-	-	✓	-	-	-
CA-C	PEM Small emergent marsh	-	-	-	✓	-	-	-
CA-D	PEM Wetland formed due to drainage received from a 12 inch RCP from parking lot	-	-	-	✓	-	-	-
CA-1 (100 series)	PFO/OW Open Water with a bordering forested wetland associated with Forge Pond	✓	✓	✓	-	-	✓	-
CA-1 (200 series)	PFO/OW Open Water with a bordering forested wetland associated with Forge Pond	✓	✓	✓	-	-	✓	-
CA-2.1 (100 series)	PFO/OW Forested wetland system associated with Beaver Meadow Brook	✓	✓	✓	-	✓	✓	-
CA-2.1 (200 series)	PFO/PSS/OW Red maple wetland with scrub shrub components associated with Beaver Meadow Brook pond system	✓	✓	✓	-	✓	✓	-
CA-BLSF-1	Additional BLSF area not associated with any flagged wetland area	-	-	-	-	-	✓	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

Stoughton

The Stoughton segment of the Stoughton alternative is approximately 4.2 miles long and contains active and inactive sections of the Stoughton Line. Twenty three wetlands are located along the right-of-way in Stoughton. The wetlands in Stoughton include forested areas dominated by red maple swamps and an unnamed perennial stream. An ANRAD was submitted to the Stoughton Conservation Commission in October 2011. The Commission issued an ORAD on June 19, 2012. Per the Commission's request, the resource areas of BLSF and ILSF were withdrawn from consideration. Table 4.16-5 lists the wetlands delineated along the right-of-way in Stoughton and the resources associated with each wetland.

Table 4.16-5 Wetland Resource Areas–Stoughton

Wetland #	Cowardin Type and Description1	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]
STA-A1.2	Intermittent stream channel	✓	-	-	-	-	-	-
STA-A1	PFO Isolated depression	-	-	-	✓	-	-	-
ST-A	PFO Connected to Wetland ST-B outside the limit of delineation	-	-	✓	-	-	✓	-
ST-B	Intermittent stream channel	✓	-	-	-	-	✓	-
ST-2.1	PFO/PEM Connected to Wetland ST-2 outside the limit of delineation	-	-	✓	-	-	-	-
ST-2.3	PFO/OW Forested wetland associated with perennial stream	✓	✓	✓	-	✓	-	-
ST-2	PFO/OW Perennial stream originating from unnamed pond east of Rte. 138 and flowing into Woods Pond	✓	✓	✓	-	✓	✓	-
ST-3[3] (100 series)	PEM/OW Intermittent stream channel associated with a pond and its emergent wetland system	-	✓	✓	-	-	-	-
ST-3 (200 series)	PEM Intermittent stream channel connected to Wetland ST-3 (100 series)	✓	-	✓	-	-	-	-
ST-4	OW Isolated depression with standing water and minimal emergent wetland vegetation	-	-	-	✓	-	-	-
ST-4A (100 series)	Intermittent stream channel	✓	-	-	-	-	-	-
ST-4A (200 series)	Intermittent stream channel connected to Wetland ST-4A (100-series)	✓	-	-	-	-	-	-

Wetland #	Cowardin Type and Description1	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]
ST-6A (200 series)	PFO Forested wetland within the ROW, connected to Wetland ST-6A (100 series) via a culvert under rail bed	-	-	✓	-	-	-	-
ST-6A (100 series)	PFO Forested wetland within ROW	-	-	✓	-	-	-	-
ST-7	PFO/PEM Large forested wetland with an intermittent stream channel	✓	-	✓	-	-	✓	-
ST-7.1	Intermittent stream channel connected to Wetland ST-7	✓	-	-	-	-	-	-
ST-7A	Intermittent stream channel connected to Wetland ST-6A upgradient via culvert under path	✓	-	✓	-	-	-	-
ST-9[3]	PEM/OW Large open marsh associated with Whitman Brook	-	✓	✓	-	-	-	-
ST-9A	Associated with Whitman Brook	-	-	✓	-	-	-	-
ST-10 (100 series)	PFO Forested wetland associated with intermittent stream	-	-	✓	-	-	-	-
ST-10 (200 series)	PFO Forested wetland along intermittent stream connected to Wetland ST-10 (100 series)	-	-	✓	-	-	-	-
ST-11 (100 series)	PEM Wet meadow	-	-	✓	-	-	-	-
ST-11[3] (200 series)	PEM Wet meadow	-	-	✓	-	-	-	-
ST-149.3	PFO Small isolated depression	-	-	-	✓	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.
2 BLSF and ILSF were withdrawn from the ANRAD application for Stoughton, and therefore neither resource area was confirmed by the Conservation Commission.
3 Shading denotes ORW.

Streams and wetlands along the right-of-way in Stoughton are part of two separate regional watersheds. Wetland systems in the northern portion of the town flow west and north into the Neponset River regional watershed, while wetlands flowing east and south are part of the Taunton River regional watershed. The Neponset River receives flow from Wetland ST 2, while the remaining wetlands south of Wetland ST 2 are tributaries to Whitman Brook, within the Taunton River watershed.

Blocked culverts and drainage ditches along the right-of-way have formed wetlands within the rail bed (Wetlands ST 6A (200 series), ST 6A (100 series), and ST 7). Wetland ST 2 (an unnamed perennial stream) flows under the tracks approximately 920 feet south of Brock Street. Wetland ST 9A is an intermittent

tributary to Whitman Brook that flows under the tracks approximately 1,170 feet south of the Stoughton Fish and Game Club access road.

Easton

The Easton segment of the Stoughton alternative is approximately 7.1 miles long and is an inactive portion of the Stoughton Line. Sixty-nine wetlands are located along the right-of-way in Easton. The wetlands in Easton include extensive forested areas dominated by red maple swamps, a large Atlantic white cedar swamp within the Hockomock Swamp, several emergent marshes, and four perennial streams. An ANRAD was submitted to the Easton Conservation Commission in October 2011. The Commission issued an ORAD rejecting the delineation of wetland resource areas on April 11, 2012; MassDEP issued a Superseding ORAD filed by MassDOT on August 29, 2012. Per the Commission's request, the resource areas of BLSF and ILSF were withdrawn from consideration. Table 4.16-6 lists the wetlands delineated along the right-of-way in Easton and the resources associated with each wetland.

Table 4.16-6 Wetland Resource Areas–Easton

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]
EA-1 (100 series)	PFO Large forested wetland associated with an intermittent stream. Connected to Wetland EA-1 (200 series)	-	-	✓	-	-	-	-
EA-1 (200 series)	OW Intermittent stream	✓	-	-	-	-	-	-
EA-2[3]	PEM Certified vernal pool, connected to Wetland EA- 4 outside limit of delineation	-	-	✓	-	-	-	-
EA-4[3]	PEM Certified vernal pool	-	-	✓	-	-	-	-
EA-5	PFO/OW Large forested wetland associated with an intermittent stream (BF 98 to 101) and Whitman Brook (200 and 300 series)	✓	✓	✓	-	✓	-	-
EA-5 (1)	PSS/OW Shrub scrub wetland associated with intermittent stream to Whitman Brook	✓	-	✓	-	-	-	-
EA-5.3	PFO Red maple swamp	-	-	✓	-	-	-	-
EA-6	PFO/PSS Forested wetland with shrub scrub components	✓	-	✓	-	-	✓	-
EA-6.1[3]	PFO/OW Intermittent stream connected to Wetland EA-5.3. Separated from Wetland EA-6 by unpaved walkway	✓	-	✓	-	-	-	-
EA-5.2	PSS Small isolated wetland within ROW	-	-	-	✓	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]
EA-6.2[3]	PSS Connected to Wetland EA-6.1 outside limit of delineation	-	-	✓	-	-	-	-
EA-5 .1[3]	PSS Certified vernal pool	-	-	-	✓	-	-	✓
EA-5 (2)[3]	PFO Forested wetland associated with intermittent stream channel. Connected to Wetland EA-7	✓	-	✓	-	-	-	-
EA-7[3]	PFO Red maple swamp connected to a larger wetland outside limit of delineation	✓	-	✓	-	-	-	-
EA-8	PFO Red maple swamp connected to Wetland EA-9 under ROW by an intermittent channel	✓	-	✓	-	-	-	-
EA-9	PSS Intermittent stream channel connected to Wetlands EA-8 and EA-10	✓	-	✓	-	-	-	-
EA-10	PSS Scrub-shrub wetland connected to Wetland EA-9	-	-	✓	-	-	-	-
EA-11	OW Intermittent stream that flows beneath the ROW	✓	-	-	-	-	-	-
EA-12.1	PFO/PSS Connected to Wetland EA-12.2 by a culvert under Main Street	✓	-	✓	-	-	-	-
Wetland 1	PSS Small wetland associated with Queset Brook	-	-	✓	-	✓	✓	-
Wetland 2	OW Queset Brook (upstream)	✓	✓	-	-	✓	✓	-
Wetland 101	OW Queset Brook (downstream)	✓	✓	-	-	✓	-	-
EA-12.2	PEM Emergent marsh connected to Wetland EA-12.1 via culvert under Main Street	-	-	✓	-	-	-	-
EA-12.3	PSS	✓	-	✓	-	-	-	-
EA-16.1	PFO Red maple dominated forested wetland	-	-	-	✓	-	-	-
EA-15	OW Large depression connected to Wetland EA-16 under ROW	-	-	✓	-	-	-	-
EA-16	PEM Connected to Wetland EA-15 under ROW	-	-	✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]
EA-19[3]	PEM Emergent marsh containing a potential vernal pool	-	-	✓	-	-	-	-
EA-20.1[3]	PFO Red maple swamp, certified vernal pool	-	-	-	✓	-	-	-
EA-20	PFO Red maple swamp	-	-	-	✓	-	-	-
EA-21	PFO Forested wetland connected to Wetland EA-22 under ROW	-	-	✓	-	-	-	-
EA-22[3]	PSS/PEM Certified vernal pool	-	-	✓	-	-	-	-
EA-23	PFO Red maple swamp connected to Wetland EA-24 under ROW	-	-	✓	-	-	-	-
EA-24[3]	PFO Forested wetland includes a certified vernal pool	-	-	✓	-	-	-	-
EA-26.1	PFO Red maple dominated wetland	-	-	-	✓	-	-	-
EA-25	PFO Connected to Wetland EA-26 under ROW	-	-	✓	-	-	-	-
EA-26	PSS Connected to Wetland EA-25 under ROW	-	-	✓	-	-	-	-
EA-27	PFO Red maple dominated wetland	-	-	✓	-	-	-	-
EA-104[3]	PFO/PSS Certified vernal pool	-	-	✓	-	-	-	-
EA-104A[3]	PFO Certified vernal pool	-	-	✓	-	-	-	-
Upgradient of EA-96	Intermittent stream channel	✓	-	-	-	-	-	-
EA-99.1	PFO/PSS Forested wetland associated with the Black Brook wetland system	-	-	✓	-	-	-	-
EA-96	PFO Part of the Black Brook wetland system	-	-	✓	-	-	-	-
EA-94	PFO Forested wetland associated with Black Brook wetland system	-	-	✓	-	-	✓	-
EA-92.1 Crossing 1	Black Brook and its associated wetland system, stream crossing under ROW connects to Wetland EA-92 (100 series)	✓	✓	-	-	✓	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]
EA-92 (100 series) Crossing 1	PFO/OW Black Brook and its associated wetland system stream crossing under ROW connects to Wetland EA-92.1	✓	✓	✓	-	✓	✓	-
EA-91 Crossing 2	Black Brook and its associated wetland system, stream crossing under ROW connects to Wetland EA-92 (200 series)	✓	✓	✓	-	✓	✓	-
EA-92 (200 series) Crossing 2	Black Brook and its associated wetland system, stream crossing under ROW connects to Wetland EA-91	✓	✓	✓	-	✓	✓	-
EA-84	OW Intermittent stream connected to Wetland EA-86	✓	-	-	-	-	✓	-
EA-86	PSS Scrub-shrub wetland	-	-	✓	-	-	-	-
EA-81	PFO/PEM Bordering an intermittent stream	✓	-	✓	-	-	✓	-
EA-82	PFO Forested wetland connected to Wetland EA-81 under ROW	✓	-	✓	-	-	-	-
EA-82.1	PSS	-	-	-	✓	-	-	-
EA-77[3]	PFO Certified vernal pool connected to Wetland EA-78 under ROW	✓	-	✓	-	-	-	-
EA-78[3]	PFO/OW Certified vernal pool	✓	-	✓	-	-	-	-
EA-76	PFO Red maple dominated wetland	-	-	✓	-	-	-	-
EA-74	PEM/OW Intermittent stream connected to Wetland EA-67 under ROW	✓	-	-	-	-	-	-
EA-67	OW	✓	-	-	-	-	-	-
EA-73[3]	PFO Certified vernal pool	-	-	✓	-	-	-	-
EA-65	PFO/PEM/OW	-	-	✓	-	-	-	-
EA-72[3]	PFO Certified vernal pool	-	-	✓	-	-	-	-
EA-66[3]	PSS/OW Certified vernal pool	-	-	-	✓	-	-	-
EA-72.1[3]	PFO Certified vernal pool	-	-	✓	-	-	-	-
EA-65.1[3]	PFO/OW Certified vernal pool	-	-	✓	-	-	-	-
EA-63 (100 series)	PFO/PSS/PEM/OW Hockomock Swamp ACEC, associated with intermittent stream	-	-	✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]
EA-63[3] (200 series) Crossing 3	PFO/PSS Hockomock Swamp ACEC BF series is associated with Black Brook	✓	✓	✓	-	✓	-	-
EA-64[3] (100 series)	PFO/PSS Hockomock Swamp ACEC, associated with intermittent stream	-	-	✓	-	-	-	-
EA-64 (200 series) Crossing 3	PFO Hockomock Swamp ACEC BF series is associated with Black Brook, Crossing 3	✓	✓	✓	-	✓	-	-
EA-64 (300 series)	PFO/PSS Hockomock Swamp ACEC	-	-	✓	-	-	-	-
EA-64 (400 series)	PSS Hockomock Swamp ACEC	-	-	✓	-	-	-	-
EA-64[3] (500 series)	PFO Hockomock Swamp ACEC	-	-	✓	-	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 BLSF and ILSF were withdrawn from the ANRAD application for Easton, and therefore neither resource area was confirmed by the Conservation Commission.

3 Shading denotes ORW.

Streams and wetlands along the right-of-way in Easton are part of the Taunton River regional watershed. Perennial streams and wetland systems along the right-of-way that discharge into this regional watershed include Whitman Brook, Queset Brook, Black Brook, and the Hockomock Swamp. Six of the fourteen stream crossings in Easton are perennial. These perennial stream crossings include Whitman Brook, Queset Brook, Black Brook, and a perennial tributary to Black Brook. Black Brook crosses the right-of-way in three separate locations. An intermittent stream has formed between Prospect Street and Purchase Street that flows in the right-of-way due to blocked culverts. This intermittent stream flows south and joins Wetland EA 96 that flows under Purchase Street. The right-of-way extends approximately 3.3 miles through the Hockomock Swamp ACEC. Wetlands EA 62 to EA 78, EA 99, and EA 102 are located within the ACEC.

Raynham

The Raynham segment of the Stoughton alternative is approximately 4.9 miles long and is an inactive portion of the Stoughton Line. Twenty-nine wetlands are located along the right-of-way in Raynham. The wetlands in Raynham include extensive forested areas dominated by red maple swamps, two wetlands that contain Atlantic white cedar swamps (Hockomock Swamp and Pine Swamp), and three perennial streams. An ANRAD was submitted to the Raynham Conservation Commission in November 2011. The Raynham ORAD was issued August 30, 2012. Table 4.16-7 lists the wetlands delineated along the right-of-way in Raynham and the resources associated with each wetland.

Streams and wetlands along the right-of-way in Raynham are part of the Taunton River regional watershed. Perennial streams and bordering wetlands along the right-of-way that discharge into this regional watershed include streams within the Hockomock Swamp, Pine Swamp, and Pine Swamp Brook. Changes in drainage patterns and inadequate drainage along the right-of-way, south of the former Greyhound Park access road, have formed a perennial stream in the right-of-way. Three of the

six streams that cross the right-of-way in Raynham are perennial. These unnamed streams are associated with Wetlands R 12.1 and R-12.2 (Pine Swamp Brook), R 62.1 (unnamed stream), and R 116 and R 113 (unnamed stream). The right-of-way in Raynham extends through Hockomock Swamp for approximately 2.0 miles. The right-of-way also extends through Pine Swamp (Wetland RA 12) for approximately 1.0 mile.

Table 4.16-7 Wetland Resource Areas–Raynham (Stoughton Line)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
EA-64[2] (500 series)	PFO Hockomock Swamp ACEC, connects to Wetland EA-63 (200 series)	-	-	✓	-	-	✓	-
EA-63[2] (200 series)	PFO Hockomock Swamp ACEC, connects to Wetland EA-64 (500 series) under ROW	-	-	✓	-	-	✓	-
R-62.1	PSS/PEM/OW Perennial stream channel with associated bordering vegetated wetlands, connects to Wetlands R-60.1 and R-60	✓	✓	✓	-	✓	-	-
R-60.1	PEM Emergent marsh with PFO fringe, connects to Wetland R-62.1	-	-	✓	-	-	-	-
R-61.1	Intermittent stream channel connects to Wetland R-62.1 outside the limit of delineation	✓	-	-	-	-	-	-
R-61	PSS Dominated by sweet pepperbush 104 connects to Wetland R-62.1	-	-	✓	-	-	-	-
R-59	PEM/PSS Sphagnum moss dominated marsh that transitions into a scrub shrub wetland	✓	-	✓	-	-	-	-
R-56	PFO Hockomock Swamp ACEC, white pine and red maple dominated wetland	-	-	✓	-	-	-	-
R-49	PFO Red maple dominated wetland, connects to Wetland R-50 under ROW	✓	-	✓	-	-	-	-
R-50 (100 & 200 series)	PFO Red maple dominated wetland, connects to Wetland R-49 under ROW	✓	-	✓	-	-	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
R-44	PFO Red maple dominated wetland, connects to Wetland R-49 under Carver Street and Wetland R-2 under ROW	✓	-	✓	-	-	✓	-
RWB-2 (100 series)	PFO Red maple dominated wetland, connects to Wetland R-44 under ROW	✓	-	✓	-	-	✓	-
RWB-2 (300 series)	PFO Red maple dominated wetland, connects to Wetland RWB-2 (100 series) outside of delineation	-	-	✓	-	-	✓	-
R-117	PFO Red maple dominated wetland	-	-	✓	-	-	-	-
R-118	OW Intermittent stream channel with associated BVW outside the limit of delineation	✓	-	-	-	-	-	-
R-113	PFO Red maple dominated wetland with associated perennial stream, connects to Wetland R-116 under ROW	✓	✓	✓	-	✓	-	-
R-116[2]	PFO Red maple dominated wetland with associated perennial stream, connects to Wetland R-113 under ROW	✓	✓	✓	-	✓	-	-
R-116A[2]	PFO Red maple dominated	-	-	✓	-	-	-	-
R-12.2[2]	PFO Red maple dominated wetland associated with Pine Swamp Brook (BF R 12.2 128 to 131) and an intermittent stream (BF R 12.2 161 to 164)	✓	✓	✓	-	✓	✓	-
R-12.1 (100 series)	PFO White pine and red maple dominated wetland, connects to Wetland R-12.1 (300 series) outside limit of delineation	-	-	✓	-	-	✓	-
R-12.1 (200 series)	PFO Red maple swamp	-	-	-	✓	-	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
R-12.1 (300 series)	PFO/PSS Red maple swamp associated with Pine Swamp Brook (R 12.1 BF 100 to 103) and an intermittent stream (R 12.1 BF 200 to 203). Connects to Wetland R-12.1 (100 series) outside limit of delineation	✓	✓	✓	-	✓	✓	-
T-5[2]	PFO Red maple swamp, connects to Wetland T 4 under ROW	-	-	✓	-	-	-	-
T-4[2]	PEM/PFO Connects to Wetland T 5 under ROW	-	-	✓	-	-	-	-
T-3	PFO Red maple swamp, connects to Wetland T 5 outside limit of delineation	-	-	✓	-	-	-	-
T-4.1	PFO Red maple swamp, connects to Wetland T 4 outside limit of delineation	-	-	✓	-	-	-	-
T-2[2]	PFO Red maple swamp, connects to Wetland T 3 outside limit of delineation	-	-	✓	-	-	-	-
R-4	Connects to Wetland R-5 outside limit of delineation	✓	-	-	-	-	-	-
R-5	PFO Red maple dominated wetland, connects to Wetland R-4 outside limit of delineation	-	-	✓	-	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

The Raynham segment of the Whittenton Branch extends from Raynham Junction at Route 138 to the municipal border between Raynham and Taunton, approximately 1.2 miles. The entire length of this section is inactive. Four wetlands are located along the right-of-way of the Whittenton Branch in Raynham. These wetlands include forested areas dominated by red maple swamps, emergent marshes, and narrow wetlands along residential areas. One intermittent stream flows under the right-of-way. Streams and wetlands in Raynham are part of the Taunton River regional watershed. Table 4.16-8 lists the wetlands delineated along the right-of-way of the Whittenton Alternative in Raynham and the resources associated with each wetland.

Table 4.16-8 Wetland Resource Areas–Raynham (Whittenton Alternative)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
EA-64[2] (500 series)	PFO Hockomock Swamp ACEC, connects to Wetland EA-63 (200 series)	-	-	✓	-	-	✓	-
EA-63[2] (200 series)	PFO Hockomock Swamp ACEC, connects to Wetland EA-64 (500 series) under ROW	-	-	✓	-	-	✓	-
R-62.1	PSS/PEM/OW Perennial stream channel with associated bordering vegetated wetlands, connects to Wetlands R-60.1 and R-60	✓	✓	✓	-	✓	-	-
R-60.1	PEM Emergent marsh with PFO fringe, connects to Wetland R-62.1	-	-	✓	-	-	-	-
R-61.1	Intermittent stream channel connects to Wetland R-62.1 outside the limit of delineation	✓	-	-	-	-	-	-
R-61	PSS Dominated by sweet pepperbush 104 connects to Wetland R-62.1	-	-	✓	-	-	-	-
R-59	PEM/PSS Sphagnum moss dominated marsh that transitions into a scrub shrub wetland	✓	-	✓	-	-	-	-
R-56	PFO Hockomock Swamp ACEC, white pine and red maple dominated wetland	-	-	✓	-	-	-	-
R-49	PFO Red maple dominated wetland, connects to Wetland R-50 under ROW	✓	-	✓	-	-	-	-
R-50 (100 & 200 series)	PFO Red maple dominated wetland, connects to Wetland R-49 under ROW	✓	-	✓	-	-	✓	-
R-44	PFO Red maple dominated wetland, connects to Wetland R-49 under Carver Street and Wetland R-2 under ROW	✓	-	✓	-	-	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
RWB-2 (100 series)	PFO Red maple dominated wetland, connects to Wetland R-44 under ROW	✓	-	✓	-	-	✓	-
RWB-2 (300 series)	PFO Red maple dominated wetland, connects to Wetland RWB-2 (100 series) outside of delineation	-	-	✓	-	-	✓	-
RWB-03[2]	PFO/PEM/OW Isolated forested depression with marsh outside of ROW. Potential vernal pool.	-	-	-	✓	-	-	-
RWB-02.1	PFO/PEM Forested wetland with wet meadow outside of ROW. Connects to RWB-02 downgradient via culvert under ROW.	✓	-	✓	-	-	-	-
RWB-02	PFO/PEM Forested wetland with large cattail marsh outside of ROW of 200 series. Connects to RWB-02.1 upgradient via culvert under ROW.	✓	-	✓	-	-	-	-
RWB-01[2]	PFO/PEM Isolated forested depression with marsh outside of ROW. Potential vernal pool.	-	-	-	✓	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Taunton

In Taunton, the Stoughton alternative includes segments of both the Stoughton Line and the New Bedford Main Line. The New Bedford Main Line segment is controlled by CSX; this segment extends from Weir Junction to Cotley Junction The two segments form one continuous track through Taunton approximately 4.7 miles long. Forty-four wetlands are located along the right-of-way in Taunton; these wetlands include four wetlands delineated in the locations of two proposed stations. The wetlands in Taunton include extensive forested areas dominated by red maple swamps, several ponds, and three perennial streams including the Taunton River. An ANRAD was submitted to the Taunton Conservation Commission in May 2011. The Commission issued an ORAD on August 10, 2011. This ORAD did not include the wetlands along the CSX-controlled portion of the right-of-way in Taunton because of lack of access. This segment encompasses wetlands from TCM-1.3 to TCM-7 West. Table 4.16-9 lists the wetlands delineated along the Stoughton Line segment of the right-of-way in Taunton and the resources

associated with each wetland. Table 4.16-10 lists the wetlands delineated along the New Bedford line segment of the right-of-way in Taunton and the resources associated with each wetland.

Table 4.16-9 Wetland Resource Areas–Taunton (Stoughton Line)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
T-2[2]	PFO Red maple swamp	-	-	✓	-	-	-	-
T-42 (200 series)	PSS/PEM Emergent wetland within the ROW	-	-	-	✓	-	-	-
T-42[2] (100 series)	PEM Emergent marsh	-	-	✓	-	-	-	-
T-43	PEM Emergent wetland	-	-	✓	-	-	-	-
T-41.2[2]	PEM Small emergent wetland	-	-	✓	-	-	-	-
T-43.1	PFO Small isolated wetland	-	-	-	✓	-	-	-
T-43.2	PFO Forested wetland bordering an intermittent stream	✓	-	✓	-	-	-	-
T-41.1[2]	PFO Isolated wetland	-	-	-	✓	-	-	-
T-41.1.1	PFO Forested wetland bordering an intermittent stream. Connected to Wetland T-43.2	✓	-	✓	-	-	-	-
T-41 (100 series)	PFO Forested wetland	-	-	✓	-	-	-	-
T-41 (200 series)	PFO Small isolated wetland	-	-	-	✓	-	-	-
T-41 (300 series)	PFO Forested wetland bordering an intermittent stream	✓	-	✓	-	-	-	-
T-40	PFO Forested wetland bordering an intermittent stream	✓	-	✓	-	-	-	-
T-39[2]	PFO Small isolated wetland	-	-	-	✓	-	-	-
TR (Crossing 1)	OW Taunton River	✓	✓	-	-	✓	-	-
T-34	PFO Forested wetland associated with Taunton River	-	-	✓	-	-	✓	-
T-37[2]	PFO Forested wetland associated with Taunton River	-	-	✓	-	-	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
TR (Crossing 2)	OW/PFO Taunton River (199 series and 300 series) WF 304 to 307 (forested wetland) TR 300 to 304 (backwaters of Taunton River)	✓	✓	✓	-	✓	✓	-
T-33[2]	PFO Forested wetland associated with Mill River	-	-	✓	-	-	-	-
MR	OW Mill River	✓	✓	-	-	✓	✓	-
TCM-1.3	PFO Forested wetland	-	-	✓	-	-	-	-
TCM-1	PFO Forested wetland	-	-	✓	-	-	✓	-
TCM-1.2[2]	OW/PFO Forested wetland bordering Taunton River BF 1 (north bank of Taunton River) TCM 1.2 and TCM 1.1 (south bank of Taunton River) TCM 1.3 WF series (PFO)	✓	✓	✓	-	✓	✓	-
TCM-1.1	PFO Forested wetland bordering Taunton River and Oakland Mills Pond	-	-	✓	-	-	✓	-
TCM-2 West[2]	PFO Forested wetland, connected to with Wetland TCM-1 West	-	-	✓	-	-	✓	-
TCM-3	PFO Red maple swamp	-	-	-	✓	-	-	-
TCM-4	PFO Forested wetland bordering an intermittent stream	-	-	✓	-	-	-	-
TCM-5	PFO Small depression with a forested overstory	-	-	✓	-	-	-	-
TCM-6[2]	PEM/PFO Emergent wetland bordered by a forested overstory	-	-	✓	-	-	-	-
TCM-7 East (200 series)	PFO Red maple swamp. Separated from Wetland TCM-7 (100) by a stone wall	-	-	✓	-	-	-	-
Wetland 1	PFO/PEM Forested wetland with emergent marsh complex	-	-	✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
Wetland 2[2]	OW/PEM Open water with emergent marsh components. Connected to a larger wetland beyond limit of delineation	-	-	✓	-	-	-	-
Wetland 3[2]	PFO/PEM	-	-	✓	-	-	-	-
TCM-7 East (100 series)	PFO/PEM Forested wetland with emergent wetland components	-	✓	✓	-	-	-	-
TCM-7 West	PEM Connects to Wetland TCM-7 East via culvert under ROW	-	✓	✓	-	-	-	-
TCM-10 West (200 series)	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-10 West (100 series)	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-9	PFO Intermittent stream flowing along ROW. Changes to a forested wetland	✓	-	✓	-	-	-	-
TCM-11	PFO/PEM Red maple swamp with emergent wetland components	-	-	-	✓	-	-	-
TCM-12	PFO/PEM Red maple swamp with emergent wetland components	-	-	✓	-	-	-	-
TCM-13	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-11B	PFO Forested wetland connected to Wetland TCM-14 under West Stevens Street	-	-	✓	-	-	-	-
TCM-14 (200 series)	PFO Red maple swamp bordering an unnamed perennial stream in Berkley	-	✓	✓	-	-	-	-
BKCM-5	PFO/OW Red maple swamp bordering an unnamed perennial stream. Connected to Wetland TCM-14 (200 series)	✓	✓	✓	-	✓	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Table 4.16-10 Wetland Resource Areas–Taunton (New Bedford Main Line)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
TCM-1	PFO Forested wetland	-	-	✓	-	-	✓	-
TCM-1.2[2]	OW/PFO Forested wetland bordering Taunton River BF 1 (north bank of Taunton River) TCM 1.2 and TCM 1.1 (south bank of Taunton River) TCM 1.3 WF series (PFO)	✓	✓	✓	-	✓	✓	-
TCM-1.1	PFO Forested wetland bordering Taunton River and Oakland Mills Pond	-	-	✓	-	-	✓	-
TCM-2 West[2]	PFO Forested wetland, connected to with Wetland TCM-1 West	-	-	✓	-	-	✓	-
TCM-3	PFO Red maple swamp	-	-	-	✓	-	-	-
TCM-4	PFO Forested wetland bordering an intermittent stream	-	-	✓	-	-	-	-
TCM-5	PFO Small depression with a forested overstory	-	-	✓	-	-	-	-
TCM-6[2]	PEM/PFO Emergent wetland bordered by a forested overstory	-	-	✓	-	-	-	-
TCM-7 East (200 series)	PFO Red maple swamp. Separated from Wetland TCM-7 (100) by a stone wall	-	-	✓	-	-	-	-
Wetland 1	PFO/PEM Forested wetland with emergent marsh complex	-	-	✓	-	-	-	-
Wetland 2[2]	OW/PEM Open water with emergent marsh components. Connected to a larger wetland beyond limit of delineation	-	-	✓	-	-	-	-
Wetland 3[2]	PFO/PEM	-	-	✓	-	-	-	-
TCM-7 East (100 series)	PFO/PEM Forested wetland with emergent wetland components	-	✓	✓	-	-	-	-
TCM-7 West	PEM Connects to Wetland TCM-7 East via culvert under ROW	-	✓	✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
TCM-10 West (200 series)	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-10 West (100 series)	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-9	PFO Intermittent stream flowing along ROW. Changes to a forested wetland	✓	-	✓	-	-	-	-
TCM-11	PFO/PEM Red maple swamp with emergent wetland components	-	-	-	✓	-	-	-
TCM-12	PFO/PEM Red maple swamp with emergent wetland components	-	-	✓	-	-	-	-
TCM-13	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-11B	PFO Forested wetland connected to Wetland TCM-14 under West Stevens Street	-	-	✓	-	-	-	-
TCM-14 (200 series)	PFO Red maple swamp bordering an unnamed perennial stream in Berkley	-	✓	✓	-	-	-	-
BKCM-5	PFO/OW Red maple swamp bordering an unnamed perennial stream. Connected to Wetland TCM-14 (200 series)	✓	✓	✓	-	✓	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Streams and wetlands along the right-of-way in Taunton are part of the Taunton River regional watershed. Wetlands and streams along the right-of-way that discharge into the Taunton River watershed include the Taunton River and Mill River systems. All six stream crossings along the right-of-way in Taunton are perennial. The tracks bridge the Taunton River in four separate locations, including three locations between Route 44 and High Street. The Taunton River (Wetlands TCM 1.1 and TCM 1.2) flows under the tracks for a fourth time between Ingell and Hart Streets. The Mill River (Wetland T 33) is bridged by the tracks just north of High Street. Three wetlands (Wetlands 1, 2, and 3) are not in the right-of-way but are adjacent to the proposed Taunton Station site.

The Taunton segment of the Whittenton Branch extends from Raynham Junction, at the municipal border between Raynham and Taunton to Whittenton Junction, approximately 2.2 miles. The entire

length of this section is inactive. The Attleboro Secondary Line, an active rail line, extends from Whittenton Junction to Weir Junction, approximately 2.4 miles. Wetland inspections were not able to be performed along this active section of track due to lack of access. The majority of this section of track (approximately 1.7 miles) is a densely developed area between Danforth Street and Weir Junction. The remaining stretch of tracks between Whittenton Junction and Danforth Street (approximately 0.7 mile) was assessed using available information.

Thirteen wetlands are located along the right-of-way of the Whittenton Branch in Taunton, plus one additional isolated wetland along the Attleboro Secondary that was identified using available information. These 18 wetlands include forested areas dominated by red maple swamps, one Atlantic white cedar swamp, emergent marshes, and one perennial stream, the Mill River. Five additional intermittent streams flow under the right-of-way. Streams and wetlands are part of the Taunton River regional watershed. Table 4.16-11 lists the wetlands delineated along the right-of-way of the Whittenton Branch and New Bedford Main Line in Taunton and the resources associated with each wetland.

Table 4.16-11 Wetland Resource Areas–Taunton (Whittenton Alternative)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
TWB-10	PFO/PEM Forested wetland with marsh outside of ROW. Connects to TWB-11 upgradient via channel; connects to TWB-09 downgradient via culvert under ROW.	✓	-	✓	-	-	-	-
TWB-09	PFO Atlantic white cedar swamp; flooded. Connects to TWB-10 upgradient via culvert under ROW (western end of culvert blocked).	✓	-	✓	-	-	-	-
TWB-08.1	PFO Saturated portion of ROW at bottom of slope from Bay Street; extends for approx. 600 ft.	-	-	-	✓	-	-	-
TWB-08	PFO Forested wetland. Connects to TWB-07 downgradient via culvert under Whittenton Street outside of ROW.	✓	-	✓	-	-	-	-
TWB-07	OW/PFO Mill River with forested wetland along part of bank. Connects to TWB-06 upgradient under ROW. Connects to TWB-08 upgradient via channel/culvert under Whittenton Street outside of ROW.	✓	✓	✓	-	✓	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
TWB-06	OW/PFO Mill River with forested wetland along part of bank. Connects to TWB-07 downgradient under ROW. Connects to TWB-05.1 upgradient via culvert under Warren Street outside of ROW.	✓	✓	✓	-	✓	-	-
TWB-05.1	PFO/PSS Two intermittent stream crossings under ROW, associated with forested and scrub-shrub area under power easement outside ROW. Connects to TWB-06 downgradient via culvert under Warren Street, and to TWB-05 upgradient via culvert under ROW.	✓	-	-	-	-	-	-
TWB-05	PFO Forested wetland. Connects to TWB-05.1 downgradient via culvert under ROW; connects to TWB-04 upgradient via culvert under ROW.	✓	-	✓	-	-	-	-
TWB-04	PFO Forested wetland. Connects to TWB-05 downgradient via culvert under ROW.	✓	-	✓	-	-	-	-
TWB-03.1	PFO Isolated forested wetland.	-	-	-	✓	-	-	-
TWB-03	PFO Forested wetland.	-	-	✓	-	-	-	-
TWB-02	PFO Forested wetland. Connects to TWB-01 upgradient via culvert under ROW.	-	-	✓	-	-	-	-
TWB-01	PFO Forested wetland. Connects to TWB-02 downgradient via culvert under ROW.	-	-	✓	-	-	-	-
TAA-19	PFO Wetland along Attleboro Secondary identified using available information	-	-	-	✓	-	-	-
TCM-1.3	PFO Forested wetland	-	-	✓	-	-	-	-
TCM-1	PFO Forested wetland	-	-	✓	-	-	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
TCM-1.2[2]	OW/PFO Forested wetland bordering Taunton River BF 1 (north bank of Taunton River) TCM 1.2 and TCM 1.1 (south bank of Taunton River) TCM 1.3 WF series (PFO)	✓	✓	✓	-	✓	✓	-
TCM-1.1	PFO Forested wetland bordering Taunton River and Oakland Mills Pond	-	-	✓	-	-	✓	-
TCM-2 West[2]	PFO Forested wetland, connected to with Wetland TCM-1 West	-	-	✓	-	-	✓	-
TCM-3	PFO Red maple swamp	-	-	-	✓	-	-	-
TCM-4	PFO Forested wetland bordering an intermittent stream	-	-	✓	-	-	-	-
TCM-5	PFO Small depression with a forested overstory	-	-	✓	-	-	-	-
TCM-6[2]	PEM/PFO Emergent wetland bordered by a forested overstory	-	-	✓	-	-	-	-
TCM-7 East (200 series)	PFO Red maple swamp. Separated from Wetland TCM-7 (100) by a stone wall	-	-	✓	-	-	-	-
Wetland 1	PFO/PEM Forested wetland with emergent marsh complex	-	-	✓	-	-	-	-
Wetland 2[2]	OW/PEM Open water with emergent marsh components. Connected to a larger wetland beyond limit of delineation	-	-	✓	-	-	-	-
Wetland 3[2]	PFO/PEM	-	-	✓	-	-	-	-
TCM-7 East (100 series)	PFO/PEM Forested wetland with emergent wetland components	-	✓	✓	-	-	-	-
TCM-7 West	PEM Connects to Wetland TCM-7 East via culvert under ROW	-	✓	✓	-	-	-	-
TCM-10 West (200 series)	PFO Red maple swamp	-	-	✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
TCM-10 West (100 series)	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-9	PFO Intermittent stream flowing along ROW. Changes to a forested wetland	✓	-	✓	-	-	-	-
TCM-11	PFO/PEM Red maple swamp with emergent wetland components	-	-	-	✓	-	-	-
TCM-12	PFO/PEM Red maple swamp with emergent wetland components	-	-	✓	-	-	-	-
TCM-13	PFO Red maple swamp	-	-	✓	-	-	-	-
TCM-11B	PFO Forested wetland connected to Wetland TCM-14 under West Stevens Street	-	-	✓	-	-	-	-
TCM-14 (200 series)	PFO Red maple swamp bordering an unnamed perennial stream in Berkley	-	✓	✓	-	-	-	-
BKCM-5	PFO/OW Red maple swamp bordering an unnamed perennial stream. Connected to Wetland TCM-14 (200 series)	✓	✓	✓	-	✓	-	-
BKCM-5	PFO/OW Red maple swamp bordering an unnamed perennial stream. Connected to Wetland TCM-14 (200 series)	✓	✓	✓	-	✓	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Berkley

In Berkley, the Stoughton alternative includes segments of both the New Bedford Main Line and the Fall River Secondary, both of which currently have active freight service. The New Bedford Main Line has approximately 2.9 miles of right-of-way, while the Fall River Secondary Line has approximately 0.8 mile of right-of-way, for a total of approximately 3.7 miles of right-of-way in Berkley.

Twenty-eight wetlands are located along the right-of-way in Berkley. Twenty wetlands occur along the New Bedford Main Line, while eight wetlands occur along the Fall River Secondary. The wetlands in Berkley include extensive forested areas dominated by red maple swamps and six perennial streams. An

ANRAD was submitted to the Berkley Conservation Commission in April 2011. The Commission issued an ORAD on June 1, 2011.

Table 4.16-12 lists the wetlands delineated along the New Bedford Main Line segment of the right-of-way in Berkley and the resources associated with each wetland. Table 4.16-13 lists the wetlands delineated along the Fall River Secondary segment of the right-of-way in Berkley and the resources associated with each wetland.

Table 4.16-12 Wetland Resource Areas–Berkley (New Bedford Main Line)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
BKCM-5	PFO Red maple swamp borders an unnamed perennial stream	✓	✓	✓	-	✓	-	-
TCM-14 (200 series)	PFO/OW Unnamed perennial stream. Connects to BKCM 5 under ROW	✓	✓	✓	-	✓	-	-
TCM-14 (100 series)	PFO Red maple swamp	-	✓	✓	-	-	-	-
BKCM-6	PFO Red maple swamp connected to Wetland TCM-14 (100 series) under ROW	-	✓	✓	-	-	-	-
BKCM-1	PSS Scrub-shrub wetland connected to Wetland BKCM-8 under ROW	-	-	✓	-	-	-	-
BKCM-2[2]	PFO Forested wetland	-	-	-	-	-	-	✓
BKCM-4[2] (100/200 series)	PFO/OW Red maple swamp bordering Cotley River	✓	✓	✓	-	✓	✓	-
BKCM-8	PFO Red maple swamp connected to Wetland BKCM-1 under ROW	-	-	✓	-	-	-	-
BKCM-9	PFO Red maple swamp. Part of Taunton River wetland system	-	-	✓	-	-	-	-
BKCM-10 (200 series)	PFO/OW Red maple swamp associated with Cotley River	✓	✓	✓	-	✓	✓	-
BKCM-10 (100 series)	PFO Red maple swamp, separated from Wetland BKCM-10 (200 series) by upland berm	-	-	✓	-	-	-	-
BKCM-4 (300 series)	PFO Red maple swamp that borders Cotley River	-	✓	✓	-	-	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
BKCM-4 (400 series)	PFO/OW Cotley River with adjacent Red maple swamp	✓	✓	✓	-	✓	-	-
BKCM-13	PFO Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	-	-
BKCM-18 .1	PFO Red maple swamp within Cotley River wetland system	-	-	✓	-	-	-	-
BKCM-18	PFO/OW Red maple swamp bordering Cotley River	✓	✓	✓	-	✓	-	-
BKCM-20	PFO Red maple swamp	-	-	✓	-	-	-	-
BK-1.1	PFO Small red maple swamp	-	-	-	✓	-	-	-
BK-1	PSS Scrub-shrub wetland bordering an unnamed perennial stream	✓	✓	✓	-	✓	-	-
BKN-1	PFO Red maple swamp bordering a perennial stream.	✓	✓	✓	-	✓	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Streams and bordering wetlands along the right-of-way in Berkley are part of the Taunton River regional watershed. The Cotley River and its bordering wetlands (Wetlands BKCM 4, 10, and 18) form the major wetland system along the right-of-way that discharges into the Taunton River. Six of the nine streams that cross the right-of-way in Berkley are perennial. Two of the perennial stream crossings are tributaries to the Cotley River, and are located between Cotley Street and Padelford Street. The Cotley River is bridged by the tracks approximately 3,500 feet south of Cotley Street, and approximately 2,800 feet south of the first crossing.

Table 4.16-13 Wetland Resource Areas–Berkley (Fall River Secondary)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
BK-3.1	PFO Red maple swamp	-	-	-	✓	-	-	-
BK-3	PSS Isolated swamp. Separated from Wetland BK-3.1 by an upland berm	-	-	-	✓	-	-	-
BK-1B	Intermittent channel crosses ROW and connected to Wetland BK-2B	-	-	✓	-	-	-	-
BK-2B	Intermittent channel	-	-	✓	-	-	-	-
BK-4	PFO Red maple swamp bordering an intermittent stream	-	-	✓	-	-	-	-
BK-7	PFO Red maple swamp	-	-	✓	-	-	-	-
LKF-1	PFO Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	-	-
LKF-2	PFO Red maple swamp	-	-	✓	-	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

Lakeville

In Lakeville, the Stoughton alternative includes segments of both the New Bedford Main Line and the Fall River Secondary, both of which currently have active freight service. The New Bedford Main Line has approximately 3.5 miles of right-of-way, while the Fall River Secondary has approximately 0.3 mile of right-of-way, for a total of approximately 3.8 miles of right-of-way in Lakeville.

Twenty-five wetlands are located along the right-of-way in Lakeville. Nineteen wetlands occur along the New Bedford Main Line, while six wetlands occur along the Fall River Secondary. The wetlands in Lakeville include an extensive forested area dominated by red maple swamps and three perennial streams. An ANRAD was submitted to the Lakeville Conservation Commission in April 2011. The Commission issued an ORAD in March 2012.

Table 4.16-14 lists the wetlands delineated along the New Bedford Main Line segment of the right-of-way in Lakeville and the resources associated with each wetland. Table 4.16-15 lists the wetlands delineated along the Fall River Secondary segment of the right-of-way in Lakeville and the resources associated with each wetland.

Table 4.16-14 Wetland Resource Areas–Lakeville (New Bedford Main Line)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
LK-2	PFO Red maple swamp	-	-	-	-	-	-	✓
LK-3	PFO Red maple swamp	-	-	✓	-	-	-	-
LK-4	PFO Red maple swamp	-	-	✓	-	-	-	-
LK-6	PFO/OW Pierce Brook & Cedar Swamp River (upstream) and Atlantic White Cedar Swamp	✓	✓	✓	-	✓	✓	-
LK-7	PFO/OW Pierce Brook & Cedar Swamp River (downstream) and Atlantic White Cedar Swamp	✓	✓	✓	-	✓	✓	-
LK-7 .1	PFO Small red maple swamp	-	-	-	✓	-	-	-
LK-9	PFO Red maple swamp	-	-	✓	-	-	-	-
LK-10.1	PSS Small isolated wetland	-	-	-	✓	-	-	-
LK-10	PFO/PSS Red maple/scrub-shrub swamp	-	-	-	✓	-	-	-
LK-12.1	PSS Scrub-shrub swamp	-	-	✓	-	-	-	-
LK-12	PFO Red maple swamp	-	-	✓	-	-	-	-
LK-13	PFO Red maple swamp	-	-	✓	-	-	-	-
LK-14	PFO Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	-	-
LK-16	PFO Red maple swamp bordering an intermittent stream, connected to Wetland LK-14	✓	-	✓	-	-	-	-
LK-17	PFO Small red maple swamp	-	-	✓	-	-	-	-
LK-18	PFO Red maple swamp	-	-	✓	-	-	-	-
LK-17.1	OW Intermittent stream in ROW	✓	-	✓	-	-	-	-
LK-19.1	Intermittent stream in ROW; non-jurisdictional	-	-	-	-	-	-	-
LK-19.2	Intermittent stream along edge of ROW; non-jurisdictional	-	-	-	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
LK-19[2]	PFO Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	-	-
LK-20	PFO Red maple swamp. Connected to Wetland LK-19	-	-	✓	-	-	-	-
LK-21 West	PFO Red maple swamp	-	-	✓	-	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Table 4.16-15 Wetland Resource Areas–Lakeville (Fall River Secondary)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
LKF-1	PFO Red maple swamp, borders an intermittent tributary to Cedar Swamp River	✓	-	✓	-	-	-	-
LKF-2	PFO Red maple swamp, borders the Cedar Swamp River	-	✓	✓	-	-	-	-
LKF-3.1	PFO Red maple swamp	-	-	✓	-	-	✓	-
LKF-3	PFO/OW Red maple swamp and Cedar Swamp River	✓	✓	✓	-	✓	✓	-
LKF-1.1	PFO Red maple swamp, bordering the Cedar Swamp River	-	✓	✓	-	-	✓	-
LKF-4	PSS Part of the Cedar Swamp River system	-	✓	✓	-	-	✓	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

Streams and bordering wetlands along the right-of-way in Lakeville are part of the Taunton River and Buzzards Bay regional watersheds. The New Bedford Main Line segment of the right-of-way crosses a 1.5 mile segment of the Assonet Cedar Swamp. Pierce Brook and Cedar Swamp River flow through the Assonet Cedar Swamp; both join and ultimately flow to the Taunton River. An intermittent stream within Wetland LK-19 that crosses under the southern end of the New Bedford Main Line segment of the right-of-way and flows into Fall Brook is designated as an Outstanding Resource Water (ORW) because it discharges into Long Pond, a drinking water supply.

Three of the five stream crossings under the right-of-way in Lakeville are perennial. The Assonet River and Cedar Swamp River both flow under the New Bedford Main Line in Cedar Swamp (Wetlands LK 6 and LK 7). The Assonet River also flows under the Fall River Secondary segment (Wetlands LKF 1 and LKF 3) approximately 600 feet north of the Lakeville/Freetown town line. An intermittent stream has formed within the right-of-way south of Wetland LK 12.1 and Howland Road due to blocked drainage. This intermittent stream flows north into Wetland LK 12.1. A second intermittent stream has formed south of Wetland LK 17, again due to blocked drainage, and flows north into Wetland LK 17.

Freetown

In Freetown, the Stoughton alternative includes segments of both the New Bedford Main Line and the Fall River Secondary, both of which currently have active freight service. The New Bedford Main Line has approximately 3.6 miles of right-of-way, while the Fall River Secondary Line has approximately 5.5 miles of right-of-way, for a total of approximately 9.1 miles of right-of-way in Freetown.

Eighty wetlands are located along the right-of-way in Freetown. Thirty eight wetlands occur along the New Bedford Main Line, while 42 wetlands occur along the Fall River Secondary. The wetlands in Freetown include extensive forested areas dominated by red maple swamps and four perennial streams. An ANRAD was submitted to the Freetown Conservation Commission in June 2011. The Commission issued an ORAD on January 23, 2012. The Freetown Station was excluded from the ORAD.

Table 4.16-16 lists the wetlands delineated along the New Bedford Main Line segment of the right-of-way in Freetown and the resources associated with each wetland. Table 4.16-17 lists the wetlands delineated along the Fall River Secondary segment of the right-of-way in Freetown and the resources associated with each wetland.

Table 4.16-16 Wetland Resource Areas–Freetown (New Bedford Main Line)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
LK-20	Red maple swamp	✓	-	✓	-	-	✓	-
LK-21 West (100 series)	PFO Red maple swamp Connected to Wetland LK-20	✓	-	✓	-	-	✓	-
LK-21 West (200 series)	PFO Red maple swamp Connected to Wetland LK-21 West (100 series)	-	-	✓	-	-	-	-
LK-24	PFO Small Isolated red maple swamp	-	-	-	✓	-	-	-
LK-25	PFO Small Isolated red maple swamp	-	-	-	✓	-	-	-
LK-25.1	PFO Small Isolated red maple swamp	-	-	-	✓	-	-	-
FRN-2	PFO/OW Red maple swamp Connected to Wetland LK-20	✓	-	✓	-	-	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
FRN-3	PFO Red maple swamp	-	-	✓	-	-	-	-
LK-21 East	PFO Red maple swamp	✓	-	✓	-	✓	✓	-
FRN-4	PFO/PSS/OW Bordering an unnamed perennial stream Connected to Wetland LK-21 East	✓	✓	✓	-	✓	✓	-
FRN-4.1	PSS Scrub-shrub wetland	-	-	✓	-	-	-	-
FRN-6	PSS	-	-	✓	-	-	✓	-
FRN-7	PFO Red maple swamp. Connected to Wetland FRN-13	✓	-	✓	-	-	✓	-
FRN-8	PFO Red maple swamp	-	-	-	✓	-	-	-
FRN-9	PFO/PEM Red maple swamp with emergent marsh connected to Wetland FRN-13	-	-	✓	-	-	-	-
FRN-13[2]	PFO/PSS Intermittent tributary to Fall Brook	✓	-	✓	-	-	✓	-
FRN-11[2]	PFO/OW Fall Brook	✓	✓	✓	-	✓	✓	-
FRN-13.1[2]	PFO/OW Fall Brook	✓	✓	✓	-	✓	✓	-
FRN-14.1	PFO Isolated red maple swamp	-	-	-	✓	-	-	-
FRN-14	PSS Borders a stormwater swale outside the limits of delineation	-	-	✓	-	-	-	-
FRN-6B (100 series)	PEM	-	-	✓	-	-	-	-
FRN-6B (200 series)	PEM Connected to Wetland FRN-6B (100 series)	-	-	✓	-	-	-	-
FRN-15	PFO Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	✓	-
FRN-18	PFO Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	-	-
FRN-19	PFO Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	-	-
FRN-20	PSS	-	-	✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
FRN-20.1	PFO Forested wetland connected to Wetland FRN-20	-	-	✓	-	-	-	-
FRN-20 West	PFO Red maple swamp	-	-	✓	-	-	-	-
FRN-AA	PFO Small isolated wetland	-	-	-	✓	-	-	-
FRN-21C	Intermittent stream channel; non-jurisdictional	-	-	-	-	-	-	-
FRN-21	PSS/PFO Scrub-shrub wetland bordering an intermittent stream	✓	-	✓	-	-	-	-
FRN-22	PFO Red maple swamp bordering an intermittent stream. Connected to Wetland FRN-23	✓	-	✓	-	-	-	-
FRN-23	PFO/PEM Red maple swamp with wet meadow	✓	-	✓	-	-	-	-
FRN-24	PFO Red maple swamp	-	-	-	✓	-	-	-
FRN-25	PFO/PEM Borders an intermittent channel and connects to Wetland FRN-26	✓	-	✓	-	-	-	-
FRN-26	PFO/PEM	-	-	✓	-	-	-	-
FRN-25A	PEM	-	-	✓	-	-	-	-
FRN-27	PFO/PEM Forested wetland with intermittent stream connected to Wetland NB-1	✓	-	✓	-	-	-	-
NB-1	OW Open channel	✓	✓	-	-	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Table 4.16-17 Wetland Resource Areas–Freetown (Fall River Secondary)

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
LKF-1A	PSS	-	-	✓	-	-	✓	-
LKF-1.1	PSS/PEM	-	-	✓	-	-	✓	-
LKF-1	PFO Red maple swamp connected to Wetland FRF-1. Separated from Wetland LKF-1.1 by an upland mound.	-	-	✓	-	-	✓	-
FRF-1	PSS Connected to Wetland LKF-1 under ROW	-	-	✓	-	-	✓	-
FRF-1A	Intermittent stream channel	✓	-	-	-	-	-	-
FRF-1B	Intermittent stream channel	✓	-	-	-	-	-	-
FRF-2[2]	PFO/PEM Red maple swamp associated with Cedar Swamp River	✓	✓	✓	-	✓	-	-
FRF-3 (100 series)	PFO/OW Red maple swamp associated with Cedar Swamp River	✓	✓	✓	-	✓	✓	-
FRF-3 (200 series)	PFO Forested wetland connected to Wetland FRF-3 (100 series)	-	-	✓	-	-	-	-
FRF-4	PFO	-	-	✓	-	-	-	-
FRF-6	PFO/PSS Connected to Wetland FRF-8 under ROW	✓	✓	✓	-	-	-	-
FRF-8[2]	PFO	-	✓	✓	-	-	-	-
FRF-9	PFO Forested wetland associated with Forge Pond. Connected to Wetland FRF-10	-	✓	✓	-	-	-	-
FRF-10	PFO Red maple swamp associated with Forge Pond	-	-	✓	-	-	-	-
FRF-10.1.3	PSS Connected to a wetland across Richmond Road	-	-	✓	-	-	-	-
FRF-10.1.2	PSS	-	-	-	✓	-	-	-
FRF-10.1.1 (100 series)	PFO Forested wetland. Connected to a larger wetland east of ROW, outside limits of delineation.	✓	-	✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
FRF-10.1.1 (200 series)	PFO Forested wetland bordering an intermittent stream channel connected to Wetland FRF-10.1.1 (100 series) under ROW	✓	-	✓	-	-	-	-
FRF-10.1 (100 series)	PFO Forested wetland. Connected to a larger wetland east of ROW, outside limit of delineation.	-	-	-	✓	-	-	-
FRF-10.1 (200 series)	PFO Small red maple swamp separated from Wetland FRF-10.1 by a stone wall.	-	-	-	✓	-	-	-
FRF-10.2 (100 series)	PSS Shrub-scrub wetland bordering an intermittent stream	✓	-	✓	-	-	-	-
FRF-10.2 (200 series)	Intermittent stream channel	✓	-	-	-	-	-	-
FRF-10.2.1	PFO Small isolated wetland	-	-	-	✓	-	-	-
FRF-10.3[2]	PFO Small isolated wetland	-	-	-	✓	-	-	-
FRF-12.5	PFO/PSS Small isolated wetland	-	-	-	✓	-	-	-
FRF-11	PFP/OW Red maple swamp bordering an unnamed pond	✓	✓	✓	-	-	✓	-
FRF-12	PFP/OW Red maple swamp bordering an unnamed pond	✓	✓	✓	-	-	✓	-
FRF-A	OW Perennial stream (Rattlesnake Brook)	✓	✓	-	-	✓	✓	-
FRF-19.1[2]	PEM Small emergent wetland	-	-	-	✓	-	-	-
FRF-19[2]	PFO Red maple swamp	-	-	✓	-	-	-	-
Wetland 1	PFO	-		✓	-	-	-	-
Wetland 1A	PFO	-		-	✓	-	-	-
Wetland 2	PFO/PSS	-		✓	-	-	-	-
Wetland 3	PEM	-		-	✓	-	-	-
Wetland 4	PSS/PEM	-		-	✓	-	-	-
Wetland 5	PEM	-		-	✓	-	-	-
Wetland 6	PFO/OW	✓		✓	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
FRF-21	PFO Large red maple swamp. Connected to Wetland 6	-	-	✓	-	-	-	-
FRF-23.1.1	Unknown	-	-	✓	-	-	-	-
FRF-23.2.1	Unknown	-	-	✓	-	-	-	-
FRF-26.2(A)	PSS Small isolated wetland	-	-	-	✓	-	-	-
FRF-26.2	PSS Shrub-scrub wetland	-	-	✓	-	-	-	-
FRF-26.3 (A)	PFO/PEM Forested wetland Connected to Wetland FRF-26.2	-	-	✓	-	-	-	-
FRF-26.3	PFO Forested wetland bordering an intermittent stream	✓	-	✓	-	-	-	-
FRF-26.1	PFO Forested wetland	-	-	✓	-	-	-	-
FRF-26.1.1	PFO Separated from FRF 26 by stone wall	-	-	✓	-	-	-	-
FRF-26	PFO Red maple swamp with an intermittent stream connected to Wetland FRF-26.1.1	✓	-	✓	-	-	-	-
FRF-27	PSS/OW Scrub-shrub wetland bordering an intermittent stream that connects to Wetland FRF-29 (200 series)	✓	-	✓	-	-	-	-
FRF-29 (100 series)	PFO	-	-	✓	-	-	-	-
FRF-29 (200 series)	PFO Forested wetland with an intermittent stream	✓	-	✓	-	-	✓	-
FRF-29.2	OW Intermittent stream channel	✓	-	-	-	-	✓	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Streams and bordering wetlands along the New Bedford Main Line in Freetown are part of the Buzzards Bay regional watershed, while streams and bordering wetlands along the Fall River Secondary are part of the Taunton River regional watershed. Perennial streams in the Taunton River watershed include Terry Brook and Rattlesnake Brook. Wetlands FRF 11 and FRF 12 comprise Terry Brook Pond, which lies on both sides of the right-of-way, north of Copicut Road on the Fall River Secondary. Bordering wetlands along this segment also flow into the Assonet River before discharging into the Taunton River. Three of

the 14 streams bridged by the Fall River Secondary in Freetown [Fall Brook (Wetlands FRN 11 and FRN 13), Rattlesnake Brook (Wetland FRN 15), and an unnamed stream (Wetland FRF 26A)] are perennial. The Freetown Conservation Commission did not confirm BVW at the wetlands associated with the proposed station (Wetlands 1 through 6), but these wetlands are included in the table for informational purposes.

New Bedford

The New Bedford segment of the Stoughton alternative is approximately 7.0 miles long and has active freight service along the New Bedford Main Line. Thirty-three wetlands are located along the right-of-way in New Bedford, three of which are isolated. The wetlands in New Bedford include extensive forested areas dominated by red maple and Atlantic white cedar swamps, and highly disturbed systems dominated by common reed (*Phragmites australis*) and other invasive plant species. An ANRAD was submitted to the New Bedford Conservation Commission in April 2011. The Commission issued an ORAD on July 12, 2011. Table 4.16-18 lists the wetlands delineated along the right-of-way in New Bedford and the resources associated with each wetland.

Streams and wetlands along the right-of-way in New Bedford are part of the Buzzards Bay regional watershed. The right-of-way in New Bedford crosses three stream channels, all of which are intermittent. Wetlands NB-21 and NB-22 are part of the Acushnet Cedar Swamp State Reservation, a Massachusetts State Park as well as a National Natural Landmark designated by the National Park Service.

Table 4.16-18 Wetland Resource Areas–New Bedford

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
FRN-27	PFO/PEM Forested wetland with intermittent stream connected to NB 1(100 series)	✓	-	✓	-	-	-	-
FRN-28	PFO Red maple swamp bordering an intermittent stream. Connect to NB 2 beyond limit of delineation	-	-	✓	-	-	-	-
NB-1 (100 series)	PSS/OW Shrub scrub wetland associated with cranberry bog. Connected to NB 1. Pond eventually becomes an intermittent stream	✓	✓	✓	-	-	-	-
NB-2	PFO Red maple swamp	-	-	✓	-	-	-	-
NB-6	PFO/PSS Forested wetland with shrub-scrub components	-	-	✓	-	-	-	-
NB-1 (200 series)	PEM Cranberry bog	✓	-	-	-	-	-	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
NB-8	PFO/PSS Red maple swamp with small areas of shrub scrub wetland. Separated from NB 6 by an upland berm	-	-	-	✓	-	-	-
NB-10	PFO Red maple swamp	-	-	✓	-	-	-	-
NB-12	PSS Shrub-scrub wetland	-	-	✓	-	-	-	-
NB-13 (100 series)	OW Perennial stream with shrub-scrub components	✓	-	✓	-	✓	-	-
NB-13 (200 series)	OW Perennial stream separated from NB 13 (100) by a footpath	✓	✓	✓	-	✓	-	-
NB-14[2]	PFO/PSS Forested wetland bordering an intermittent stream	-	-	✓	-	-	-	-
NB-11	PFO/PSS Forested wetland bordering an intermittent stream	-	-	✓	-	-	-	-
NB-15	OW Perennial stream channel running parallel to ROW	✓	✓	✓	-	✓	-	-
NB-16	PFO Forested wetland, part of Acushnet Cedar Swamp	-	-	✓	-	-	-	-
NB-18	PFO Forested wetland, part of Acushnet Cedar Swamp	-	-	✓	-	-	-	-
NB-17	PFO/PSS Forested wetland bordering an intermittent stream	-	-	✓	-	-	-	-
NB-21	PFO Forested wetland, part of Acushnet Cedar Swamp	-	-	✓	-	-	-	-
NB-19	PEM Small isolated wetland	-	-	-	✓	-	-	-
NB-20	OW Perennial stream parallel to the ROW	✓	✓	✓	-	✓	✓	-
NB-22[2]	PFO/OW Perennial stream channel with bordering forested wetland, part of the Acushnet Cedar Swamp	✓	✓	✓	-	✓	✓	-

Wetland #	Cowardin Type and Description[1]	Bank	LUW	BVW	IVW	RA	BLSF	ILSF
NB-20.1	PFO Small forested wetland connected to Wetland NB20	-	-	✓	-	-	-	-
NB-23 (200 series)	PFO Red maple swamp	✓	-	✓	-	-	-	-
NB-23 (100 series)	PFO Red maple swamp bordering an intermittent stream connected to NB 23 (200 series)	✓	-	✓	-	-	-	-
NB-24	PFO/PEM Forested wetland with emergent marsh	-	-	✓	-	-	-	-
NB-25	PFO Isolated depression	-	-	-	✓	-	-	-
NB-25.1	PSS Shrub scrub wetland associated with intermittent stream	-	-	✓	-	-	-	-
NBS (1)	PFO Forested wetland	-	-	✓	-	-	-	-
NBS (2)	PFO/PEM Forested wetland with emergent wetland along fringe	-	-	✓	-	-	-	-
NBS	PEM Emergent wetland	-	-	✓	-	-	-	-
NB-28	PFO/OW Red maple swamp bordering an intermittent stream	✓	-	✓	-	-	-	-
WLF	PFO/PEM Emergent marsh dominated -by common reed (*Phragmites australis*)	-	-	✓	-	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding.

2 Shading denotes ORW.

Fall River

The Fall River segment of the Stoughton alternative is approximately 5.3 miles long and has active freight service along the Fall River Secondary. This segment of the right-of-way passes through high density residential, commercial, and industrial areas. Seventeen wetlands are located along the right-of-way in Fall River, one of which is an isolated federal wetland. The wetlands in Fall River include disturbed systems dominated by common reed and other invasive species, and one perennial stream. An ANRAD was submitted to the Fall River Conservation Commission in May 2011. The Commission issued an ORAD on July 12, 2011. Table 4.16-19 lists the wetlands delineated along the right-of-way in Fall River and the resources associated with each wetland.

Table 4.16-19 Wetland Resource Areas–Fall River

Wetland #	Cowardin Type and Description[1]	Bank	Coastal Bank	LUW	BVW	IVW	RA	LSCSF	ILSF
FRF-29.1	Intermittent stream channel under ROW	✓	-	-	-	-	-	-	-
FA-1B(1)	Intermittent stream channel	✓	-	-	-	-	-	-	-
FA-1B(2)	Intermittent stream channel	✓	-	-	-	-	-	-	-
FA-1A	Intermittent stream channel	✓	-	-	-	-	-	-	-
FA-1A(2)	PFO Small forested wetland connected to Wetland FA-1A	-	-	-	✓	-	-	-	-
FA-1	PFO Disturbed forested wetland connected to FA-2	-	-	-	✓	-	-	-	-
FA-2	PFO/PSS Forested wetland connected to Taunton River	-	-	-	✓	-	-	✓	-
FA-3	PFO Large forested wetland bordering an intermittent stream that is connected to Taunton River.	-	-	-	✓	-	-	✓	-
FA-3B	OW Taunton River	-	✓	✓	-	-	✓	✓	-
FA-3A	PEM Isolated depression	-	-	-	-	✓	-	-	-
SB[2]	OW Perennial Stream	-	✓	✓	-	-	✓	-	-
FA-5B	OW Taunton River	-	✓	✓	-	-	✓	✓	-
FA-6B	OW Taunton River	-	✓	✓	-	-	✓	✓	-
QR[2]	OW Quequechan River	✓	-	✓	-	-	✓	-	-
Wetland 1	OW Open water associated with Crab Pond	✓	-	✓	-	-	-	-	-
Wetland 3	PEM Disturbed emergent wetland within ROW dominated by common reed (*Phragmites australis*)	-	-	-	✓	-	-	-	-

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub/Shrub. Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, LSCSF = Land Subject to Coastal Storm Flowage, ILSF = Isolated Land Subject to Flooding.

2 Not field delineated. Approximate limit of Bank retrieved from the MassGIS wetlands data layer.

Fall River is the only municipality along the South Coast Rail project corridor that has coastal wetland resource areas (five areas of Land Subject to Coastal Storm Flowage and four areas of Coastal Bank). Streams and bordering wetlands along the right-of-way in Fall River are part of the Narragansett Bay

regional watershed. All wetlands along the right-of-way in Fall River discharge into the Taunton River. Areas of the Taunton River along the right-of-way were delineated using ordinary high water lines.

Summary

Stoughton Alternative

The South Coast Rail project corridor for the Stoughton Alternative contains 276 Bordering Vegetated Wetlands, 52 additional Isolated Vegetated Wetlands, and two areas of Isolated Land Subject to Flooding within or directly adjacent to the right-of-way. These 329 vegetated wetlands are subject to jurisdiction under Sections 404 and 401 of the Federal Clean Water Act. In addition, the Stoughton Alternative crosses (or is within Riverfront Area of) 52 perennial streams or rivers, and is within the 100 year floodplain in 69 locations. There are 70 waterbodies (perennial streams and ponds) along the South Coast Rail project corridor. A total of 136 areas of Bank (which include banks of perennial as well as intermittent streams, ponds, and any other waterbody) are present along the project corridor. Table 4.16-20 provides a summary of the number of different wetland resource types along the right-of-way, by municipality and in total.

Table 4.16-20 Summary of Existing Conditions (Stoughton Alternative)

Municipality	Total Delineated Areas[1]	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]	Coastal Bank	LSCSF
Canton	10	4	4	6	4	2	5	0	0	0
Stoughton	23	9	4	15	3	2	4	0	0	0
Easton	72	29	9	55	8	10	10	1	0	0
Raynham	29	13	5	25	1	5	10	0	0	0
Taunton	44	10	8	35	7	5	8	0	0	0
Berkley	28	10	11	24	3	8	3	0	0	0
Lakeville	28	8	6	22	3	3	6	1	0	0
Freetown	87	36	12	61	19	7	21	0	0	0
New Bedford	32	11	5	28	3	5	2	0	0	0
Fall River	16	6	6	5	1	5	0	0	4	5
TOTAL	**369**	**136**	**70**	**276**	**52**	**52**	**69**	**2**	**4**	**5**

1 Delineated areas may qualify as more than one type of wetland resource area.
Wetland Classifications: LUW=Land Under Water, BVW = Bordering Vegetated Wetland, IVW = Isolated Vegetated Wetland, RA = Riverfront Area, BLSF = Bordering Land Subject to Flooding, LSCSF = Land Subject to Coastal Storm Flowage, ILSF = Isolated Land Subject to Flooding.
2 BLSF and ILSF were withdrawn from the ANRAD applications for the municipalities of Stoughton and Easton, and therefore neither resource area was confirmed by the Conservation Commissions from either municipality.

Whittenton Alternative

There are four wetland areas along the right-of-way of the Whittenton Branch in Raynham, and 13 wetland areas along the right-of-way of the Whittenton Branch in Taunton, plus one additional isolated wetland along the Attleboro Secondary that was identified using available information. All of these 18 wetlands are considered Waters of the United States, while 13 wetlands are considered state jurisdictional. The Whittenton Branch includes one perennial stream crossing and six intermittent stream crossings. All the streams and wetlands along the Whittenton Branch are in the Taunton River regional watershed. The South Coast Rail project corridor for the Whittenton Alternative as a whole

contains 351 total delineated wetland areas. Table 4.16-21 provides a summary of the number of different wetland resource types along the right-of-way of the Whittenton Alternative, by municipality and in total.

Table 4.16-21 Summary of Existing Conditions (Whittenton Alternative)

Municipality	Total Delineated Areas[1]	Bank	LUW	BVW	IVW	RA	BLSF[2]	ILSF[2]	Coastal Bank	LSCSF
Canton	10	4	4	6	4	2	5	0	0	0
Stoughton	23	9	4	15	3	2	4	0	0	0
Easton	72	29	9	55	8	10	10	1	0	0
Raynham	17	9	1	14	2	1	6	0	0	0
Taunton	38	12	7	32	5	4	4	0	0	0
Berkley	28	10	11	24	3	8	3	0	0	0
Lakeville	28	8	6	22	3	3	6	1	0	0
Freetown	87	36	12	61	19	7	21	0	0	0
New Bedford	32	11	5	28	3	5	2	0	0	0
Fall River	16	6	6	5	1	5	0	0	4	5
TOTAL	**351**	**134**	**65**	**262**	**51**	**47**	**61**	**2**	**4**	**5**

1 Delineated areas may qualify as more than one type of wetland resource area.

4.16.9 Analysis of Impacts

4.16.9.1 Introduction

Section 4.16.8 - Existing Conditions above identified the wetlands near each of the proposed station sites, layover facilities sites and railroad corridors associated with the South Coast Rail project alternatives. Section 4.16.9 (this section) identifies the impacts to wetland resources that may result from implementing each of the proposed South Coast Rail alternatives (inclusive of railroad alignments, train stations, and layover facilities).

Wetland resources are protected under several state and federal regulatory programs, including Section 404 of the (federal) Clean Water Act, the Massachusetts Clean Waters Act (MGL Chapter 21, §26-53) and the Massachusetts Wetlands Protection Act (310 CMR 10.00). Issues specific to Stormwater Management are addressed in Chapter 4.17, *Water Resources*; however, certain wetlands are protected and subject to higher standards of treatment prior to discharge. The alternatives discussed in this chapter are exempt from Local Wetland Bylaws as the project is a state transportation project.[32]

This section discusses environmental consequences as they relate to the proposed alternatives for the South Coast Rail project as well as historical impacts and reasonably foreseeable future impacts that help in the design and selection of mitigation for direct wetland impacts.

[32] MassDOT Interoffice Memorandum from M. Conyngham General Council to K. Walsh Director of Environmental Services dated May 2, 2011.

Some waterways are also regulated under MGL Chapter 91, which protects the public interest in tidelands, Great Ponds, and non-tidal rivers. More detail on compliance with regulations protecting coastal resources is provided in Chapter 4.18, *Coastal Zone Consistency and Chapter 91 – Compliance*. Potential impacts to ground and surface drinking water supplies, water supply protection districts, and stormwater management are discussed in Chapter 4.17, *Water Resources*. Important wetland wildlife habitat, such as vernal pools and Atlantic white cedar swamps would also be impacted by the South Coast Rail project. More detail on these resources is provided in Chapter 4.14, *Biodiversity, Wildlife and Vegetation*. Cumulative impacts to wetlands are discussed in Chapter 5, *Indirect Effects and Cumulative Impacts*.

Wetland impacts are described quantitatively by specific wetland resources as well as qualitatively by functions and values. These direct and indirect impacts are discussed along with potential mitigation efforts and how they relate to the state and federal regulatory process. The direct and indirect assessment methodologies are discussed in Section 4.16.7. Section 4.16.9.2 identifies direct impacts, Section 14.16.9.3 identifies indirect impacts, Section 4.16.9.4 identifies general temporary construction period impact, and Section 4.16.9.5 summarizes the impacts by alternative. Section 4.16.10 presents mitigation approaches, and Section 4.16.11 discusses compliance with wetland regulations and the need for the Commissioner of MA DEP to issue a Variance for impacts associated with Bordering Vegetated Wetlands (BVW) and other resource areas.

4.16.9.2 Direct Impacts

This section evaluates the potential impacts to wetlands associated with the project alternatives that are being advanced for consideration. These alternatives include the No-Build Alternative (Enhanced Bus), the Stoughton Alternatives (Electric and Diesel), and the Whittenton Alternatives (Electric and Diesel). The alternatives considered would include the construction or rehabilitation of new railroads, stations, and layover facilities. Figure 1.4-1 shows the route for each alternative. The results of the analysis of direct wetland impacts along the South Coast Rail project alternatives are presented below. The direct impacts to wetland resource areas along the right-of-way are discussed. Direct impacts were calculated separately for federal vs. state jurisdictional resources, and area was tabulated by municipality, cover type, and watershed. The impacts presented include portions of the rail lines within the southern part of the South Coast Rail study area that are common to both rail alternatives, as well as any impacts associated with station improvements.

Using the methods of analysis previously described, permanent and temporary direct impacts were calculated to state wetland/aquatic resource areas in each municipality along the right-of-way:

- Bank;
- Bordering Vegetated Wetlands (BVW);
- Land Under Water (LUW);
- Bordering Land Subject to Flooding (BLSF);
- Isolated Land Subject to Flooding (ILSF);
- Riverfront Area (RA);

- Land Subject to Coastal Storm Flowage (LSCSF); and
- Coastal Bank.

The direct (permanent and temporary) impacts to the wetlands in each municipality are presented below.

Figures 4.16-2a-q, 4.16-3a-q, 4.16-4a-j, and 4.16-5a-e show the locations of all direct wetland impacts, as well as the functions and values provided by each wetland. For a more detailed view of existing wetlands within or adjacent to proposed station locations and layover facilities see Chapter 4.17, *Water Resources*.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would consist of enhancing current bus service along existing roads and highways. Three existing park-and-ride facilities would be modified as part of the No-Build Alternative:

- The West Bridgewater Park-and-Ride lot is located near the southwest corner of the intersection of Routes 106 and 24;
- The Mount Pleasant Street Park-and-Ride lot is located on the northwest corner of the intersection of King's Highway and Route 140 in New Bedford;
- The Silver City Galleria Park-and-Ride lot is located adjacent to the Silver City Galleria shopping mall in Taunton.

None of the park-and-ride facilities contains wetland resources nor would the proposed modifications be expected to impact wetland resources.

Stoughton Electric Alternative

The Stoughton Electric Alternative alignment would be comprised of a portion of the Northeast Corridor and the Stoughton Line (north of Weir Junction where it joins the New Bedford Main Line). This alternative would use the Northeast Corridor from South Station to Canton Junction, and the existing Stoughton Line from Canton Junction to the relocated Stoughton Station (Figures 4.16-2a-b). From that point, commuter rail service would be extended, using an out-of-service rail bed, south through Raynham Junction to Weir Junction in Taunton, where it would join the northern end of the Southern Triangle (Figures 4.16-b-q). The Southern Triangle portion of the project is common to the Stoughton and Whittenton alternatives and requires the rail bed, track, and signals along the existing Fall River Secondary and New Bedford Main Lines to be upgraded for passenger rail traffic. This portion of the project extends from Weir Junction in Taunton along the New Bedford Main Line through Berkley, Lakeville, Freetown, and New Bedford and along the Fall River Secondary from Myricks Junction in Lakeville through Freetown and Fall River (Figures 4.16-3a-q and 4.16-4a-j).

This alternative would include Battleship Cove Station, Canton Center Station, Canton Junction Station, Easton Village Station, Fall River Depot Station, Freetown Station, King's Highway Station, North Easton Station, Raynham Park Station, Stoughton Station, Taunton Station, Taunton Depot Station, and Whale's Tooth Station. Three existing train stations along the Stoughton Line would be reconstructed (Canton Center Station, Canton Junction Station, and Stoughton Station). Stoughton Station would be relocated to eliminate conflicts with traffic in Stoughton Center and to support downtown revitalization efforts.

Four new train stations would be constructed along this alignment (North Easton Station, Easton Village Station, Raynham Park Station, and Taunton Station). The alternative includes two layover facilities (Weaver's Cove East on the Fall River Secondary and Wamsutta on the New Bedford Main Line). Potential impacts to wetland resources resulting from developing the new stations and layover facilities are inclusive and not discussed separately.

No construction would be required along the Northeast Corridor. The existing Stoughton Line commuter rail track from Canton Junction to Stoughton would be upgraded for the Stoughton Electric Alternative. New track would be installed on the existing embankment from Stoughton south to Weir Junction. A section from Foundry Street in Easton to Raynham Station through the Hockomock Swamp would be constructed on an elevated trestle (Figures 4.16-2k-l). Canopy clearing would be required along the right-of-way where the elevated trestle would be located within the Hockomock Swamp, so as to accommodate additional height requirements associated with the trestle. Canopy clearing generally occurs within upland forest along the existing railroad grade, although portions would occur in wetland resources. Canopy clearing would not result in additional discharge of fill material into wetland resources as this work would occur from uplands (i.e., the existing railroad grade), without the necessity of temporary construction areas in wetlands. All canopy clearing in wetlands is accounted for in the 4-foot zone of temporary impact beyond the toe of slope. No work, or vegetation removal, would take place outside of the proposed limit of work. The amount of upland forest habitat impact was also calculated based on the limit of work line, which includes the zone of temporary impacts.

The alignment of the proposed Stoughton Alternative follows a previously developed railroad corridor. Although the rail corridor has been established, necessary track improvements would result in the loss of wetland resources along the right-of-way. The following sections describe both direct and indirect impacts as they relate to this alternative.

Direct Impact to State and Federal Resource Areas by Municipality

In addition to state resource areas, this section quantifies and discusses the federal waters of the United States. These wetlands are assumed jurisdictional under Section 404 of the Clean Water Act. These wetlands are also regulated at the state level by 314 CMR 9.00, which implements the federal Section 401 Water Quality Certification program for a discharge of dredged or fill material.

For the purposes of this assessment, waters of the United States are described as either waterbodies/waterways (WW) or vegetated wetlands (VW). The Section 404(b)(1) guidelines consider wetlands to be special aquatic sites. Using the analysis methods described previously, direct impacts (both permanent and temporary) were calculated to federal waters of the United States (including wetlands) in each municipality. Impacts were totaled for each municipality as a whole. The direct impacts to federal wetlands in each municipality are presented below. Although some small wetlands within the project corridor are isolated–i.e., they are not adjacent to any traditional navigable waters or tributaries thereto–the applicant is not asserting that these wetlands do not have a significant nexus to traditional navigable water. Therefore these wetlands are assumed to be jurisdictional waters of the United States under Section 404. The numbers of impacted waters/wetlands and the total size of the impact for each type of resource area are given for each municipality.

Canton—The Canton segment of the Stoughton alternative is approximately 2.3 miles long and is an active commuter and freight service on the Stoughton Line. Reconstructing the existing active rail line in Canton would result in permanent and temporary impact to BVW in two wetlands, with 1,200 square

feet (sf) (<0.1 acre) of permanent impact and 1,436 sf (<0.1 acre) of temporary impact, for a total of 2,636 sf (0.1 acre) of alteration to BVW. Bank would be permanently impacted in two locations, with a total of 90 linear feet (lf) impact. LUW would be temporarily impacted in one wetland, with a total of 229 sf (<0.1 acre) of impact. BLSF would be permanently impacted in five locations, with a total of 40,079 sf (0.9 acre) of impact. RA would be permanently impacted in one location, with a total of 17,257 sf (0.4 acre) of new development. Direct wetland impacts to BLSF and RA in Canton are primarily associated with Beaver Meadow Brook (Wetland CA 2.1). A small amount (less than 0.1 acre) of BVW fill would also occur in this wetland.

Reconstructing the existing active rail line in Canton for the South Coast Rail project would result in permanent impact to two VWs, with a total of 1,200 square feet (sf) (<0.1 acre) of permanent impact, and temporary impact to four VWs, with a total of 2,049 sf (<0.1 acre) of temporary impact. One WW would be temporarily impacted, with a total of 229 sf (0.1 acre) of temporary impact. Direct impacts in Canton would be mainly limited to VW impacts associated with Wetland CA 2.1, Beaver Meadow Brook. Table 4.16-22 lists the impacted wetlands in Canton and the size of each impacted area.

Stoughton—The Stoughton segment of the Stoughton alternative is approximately 4.2 miles long and contains active and inactive sections of the Stoughton Line. Reconstructing the existing active and inactive rail line in Stoughton would result in permanent impact to BVW in six wetlands, with 86,974 sf (2.0 acres) of impact, and temporary impact to BVW in five wetlands, with 6,198 sf (0.1 acre) of impact, for a total of 93,172 sf (2.1 acres) of alteration to BVW. Bank would be permanently impacted in three locations, with a total of 539 lf of impact. LUW would not be impacted. BLSF would be permanently impacted in one location, with a total of 32,008 sf (0.7 acre) of impact. RA would not be impacted.

The 2.0 acres of BVW fill in Stoughton is the largest amount in any municipality. Most of this fill (1.9 acres) is associated with Wetlands ST 6A and ST 7. The fill to Wetland ST 7 is the single largest area of BVW fill associated with the project and would result from constructing the new frontage road south of Morton Street. Additional direct wetland impacts in Stoughton would include approximately 470 lf of Bank associated with Wetland ST 7A, a small intermittent stream channel that flows within the right-of-way south from Wetland ST 6A (100 series). No state jurisdictional wetland impacts would occur in Stoughton from constructing the North Easton Station. The new frontage road would affect approximately 0.7 acre of BLSF.

Table 4.16-22 Direct Impacts to State and Federal Resource Areas–Canton

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
	Perm.	Perm.	Temp.	Perm.	Temp.	Perm.	Perm.	New	Redev.	Perm.	Temp.	Perm.	Temp.
Wetland ID	**(lf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**
CA-1 (200)	-	-	-	-	229	5,387	-	-	-	-	229	-	-
CA-2.1 (100)	33	160	624	-	-	32,779	-	17,257	21,620	-	-	160	624
CA-2.1 (200)	57	1,040	812	-	-	375	-	-	-	-	-	1,040	812
CA-1 (100)	-	-	-	-	-	576	-	-	-	-	-	-	-
CA-BLSF-1	-	-	-	-	-	962	-	-	-	-	-	-	-
CA-B	-	-	-	-	-	-	-	-	-	-	-	-	303
CA-B1	-	-	-	-	-	-	-	-	-	-	-	-	310
TOTAL	90	1,200	1,436	0	229	40,079	0	17,257	21,620	0	229	1,200	2,049
TOTAL (ac)		<0.1	<0.1	0.0	<0.1	0.9	0.0	0.4	0.5	0.0	<0.1	<0.1	<0.1

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Reconstructing the existing active and inactive rail line in Stoughton would result in permanent impact to eight VWs, with a total of 90,729 sf (2.1 acres) of impact, and temporary impact to six VWs, with a total of 6,504 sf (0.1 acre) of impact. No WW impacts would occur. The 2.1 acres of fill to VWs in Stoughton is the largest amount that would occur in any municipality. Most of this fill (1.9 acres) is associated with Wetlands ST 6A and ST 7 and would result from constructing the new frontage road south of Morton Street. One VW, Wetland ST 149.3, would be filled to construct the North Easton Station. Table 4.16-23 lists the impacted wetlands in Stoughton and the size of each impacted area.

Easton—The Easton segment of the Stoughton alternative is approximately 7.1 miles long and is an inactive portion of the Stoughton Line. Reconstructing the existing inactive rail line in Easton would result in permanent impact to BVW in nine wetlands, with 14,828 sf (0.3 acre) of impact, and temporary impact to BVW in 13 wetlands, with 8,719 sf (0.2 acre) of impact, for a total of 23,547 sf (0.5 acre) of alteration to BVW. Bank would be permanently impacted in four locations, with a total of 5,423 lf of impact. LUW would not be impacted. BLSF would be permanently impacted in two locations, with a total of 36,526 sf (0.8 acre) of impact. RA would be permanently impacted in four locations, with a total of 35,715 sf (0.8 acre) of new development.

Unavoidable direct impacts to BLSF and RA would be primarily associated with Whitman Brook (Wetland EA 5), Black Brook (Wetlands EA 92.1 and 91), and Queset Brook (Wetland 2), all of which cross the right-of-way. Wetland EA 92.1 also has 0.8 acre of BLSF associated with it. An intermittent stream has formed within the right-of-way upgradient of Wetland EA 96 due to blocked drainage ditches; relocating this channel would result in 5,350 lf of bank impact. Additional direct wetland impacts in Easton would include 0.3 acre of BVW fill. The majority (0.2 acre) of this fill occurs in Wetland EA 12.1, a narrow wetland area that has formed within the right-of-way. No direct impacts would occur in the Hockomock Swamp because the tracks would be on an elevated trestle.

Constructing the North Easton Station would permanently impact 319 sf (<0.1 acre) of BVW in Wetland EA 1 (100). Constructing the Easton Village Station would permanently impact 1,552 sf (<0.1 acre) of BLSF in Wetland 101 and 5,749 sf (0.1 acre) of RA in Wetland 2. Both wetlands are associated with Queset Brook.

Reconstructing the existing inactive rail line in Easton would result in permanent impact to 11 VWs, with a total of 18,134 sf (0.4 acre) of impact, and temporary impact to 15 VWs, with a total of 9,265 sf (0.2 acre) of impact. No WW impacts would occur. Direct impacts in Easton would include 0.4 acre of fill to VWs. The majority (0.2 acre) of this fill occurs in Wetland EA 12.1, a narrow wetland area that has formed within the right-of-way. Other direct impacts are to six areas that have been designated as certified vernal pools along the right-of-way. No direct impacts would occur in the Hockomock Swamp because the tracks would be on an elevated trestle. Constructing the North Easton Station would permanently impact 319 sf (<0.1 acre) of VW in Wetland EA 1 (100). No federal resource areas would be impacted from constructing the Easton Village Station. Table 4.16-24 lists the impacted wetlands in Easton and the size of each impacted area.

Table 4.16-23 Direct Impacts to State and Federal Resource Areas–Stoughton

	Bank	BVW		LUW		BLSF[1]	ILSF[1]	RA		Waterbody/Waterway		Vegetated Wetlands	
	Perm.	Perm.	Temp.	Perm.	Temp.	Perm.	Perm.	New	Redev.	Perm.	Temp.	Perm.	Temp.
Wetland ID	(lf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)
STA-A1.2	45	-	-	-	-	-	-	-	-				
ST-A	-	161	216	-	-	-	-	-	-	-	-	161	216
ST-3 (100)	-	399	781	-	-	-	-	-	-	-	-	399	781
ST-4	-	-	-	-	-	-	-	-	-	-	-	1,146	306
ST-4A (200)	25	-	-	-	-	-	-	-	-				
ST-6A (200)	-	21,102	761	-	-	-	-	-	-	-	-	21,102	761
ST-6A (100)	-	12,010	-	-	-	-	-	-	-	-	-	12,010	-
ST-7	-	51,538	4,422	-	-	32,008	-	-	-	-	-	51,538	4,422
ST-7A	469	1,764	18	-	-	-	-	-	-	-	-	1,764	18
ST-149.3	-	-	-	-	-	-	-	-	-	-	-	2,609	-
TOTAL	539	86,974	6,198	0	0	32,008	0	0	0	0	0	90,729	6,504
TOTAL (ac)		2.0	0.1	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	2.1	0.1

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 BLSF and ILSF were withdrawn from the ANRAD application for the municipality of Stoughton, and therefore neither resource area was confirmed by the Conservation Commission. Information for these resource areas is approximate.

Table 4.16-24 Direct Impacts to State and Federal Resource Areas–Easton

	Bank	BVW		LUW		BLSF[1]	ILSF[1]	RA		Waterbody/Waterway		Vegetated Wetlands	
	Perm.	Perm.	Temp.	Perm.	Temp.	Perm.	Perm.	New	Redev.	Perm.	Temp.	Perm.	Temp.
Wetland ID	(lf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)		(sf)
EA-1 (200)	30	-	-	-	-	-	-	-	-	-	-	-	-
EA-1 (100)	-	319	303	-	-	-	-	-	-	-	-	319	303
EA-2	-	796	596	-	-	-	-	-	-	-	-	796	596
EA-5	-	-	-	-	-	-	-	11,134	8,309	-	-	-	-
EA-6.1	-	-	116	-	-	-	-	-	-	-	-	-	116
EA-7	38	111	87	-	-	-	-	-	-	-	-	111	87
EA-12.2	-	1,151	137	-	-	-	-	-	-	-	-	1,151	137
EA-12.1	-	10,920	1,723	-	-	-	-	-	-	-	-	10,920	1,723

	Bank	BVW		LUW		BLSF[1]	ILSF[1]	RA		Waterbody/Waterway		Vegetated Wetlands	
	Perm.	Perm.	Temp.	Perm.	Temp.	Perm.	Perm.	New	Redev.	Perm.	Temp.	Perm.	Temp.
Wetland ID	(lf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)		(sf)
EA-12.3	-	-	-	-	-	-	-	-	-	-	-	2,127	221
EA-16	-	355	1,084	-	-	-	-	-	-	-	-	355	1,084
EA-22	-	-	116	-	-	-	-	-	-	-	-	-	116
EA-24	-	828	2,553	-	-	-	-	-	-	-	-	828	2,553
EA-25	-	199	832	-	-	-	-	-	-	-	-	199	832
EA-26.1	-	-	-	-	-	-	-	-	-	-	-	1,179	325
EA-27	-	-	819	-	-	-	-	-	-	-	-	-	819
EA-104A	-	149	136	-	-	-	-	-	-	-	-	149	136
Upgradient of EA-96	5,350	-	-	-	-	-	-	-	-	-	-	-	-
EA-77	-	-	217	-	-	-	-	-	-	-	-	-	217
EA-78	5	-	-	-	-	-	-	-	-	-	-	-	-
Wetland 101	-	-	-	-	-	1,552	-	-	-	-	-	-	-
Wetland 2	-	-	-	-	-	-	-	5,749	8,411	-	-	-	-
EA-92.1	-	-	-	-	-	34,974	-	5,249	9,249	-	-	-	-
EA-91	-	-	-	-	-	-	-	13,583	25,351	-	-	-	-
TOTAL	5,423	14,828	8,719	0	0	36,526	0	35,715	51,319	0	0	18,134	9,265
TOTAL (ac)		0.3	0.2	0.0	0.0	0.8	0.0	0.8	1.2	0	0	0.4	0.2

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 BLSF and ILSF were withdrawn from the ANRAD application for the municipality of Easton, and therefore neither resource area was confirmed by the Conservation Commission. Information for these resource areas is approximate.

Raynham—The Raynham segment of the Stoughton alternative is approximately 4.9 miles long and is an inactive portion of the Stoughton Line. Reconstructing the existing inactive rail line in Raynham would result in permanent impact to BVW in 17 wetlands, with 58,628 sf (1.3 acres) of impact, and temporary impact to BVW in 21 wetlands, with 41,403 sf (0.9 acre) of impact for a total of 100,031 sf (2.3 acres) of alteration to BVW. Bank would be permanently impacted in eight locations, with a total of 6,994 lf of impact. LUW would be permanently impacted in two wetlands, with a total of 66,528 sf (1.5 acres) of impact, and temporarily impacted in four wetlands, with a total of 3,639 sf (0.1 acre) of impact. BLSF would be permanently impacted in three locations, with a total of 126,940 sf (2.9 acres) of impact. RA would be permanently impacted in three locations, with a total of 110,368 sf (2.5 acres) of new development.

Raynham has some of the largest direct wetland impacts along the project corridor. Blocked drainage ditches have forced water to travel down the right-of-way, which has formed a perennial stream (Wetland R 62.1). Relocating this stream to one side of the right-of-way would create impacts to over 6,500 lf of Bank, 204 sf of BVW, 1.5 acres of LUW, and 2.3 acres of RA to reconstruct the railroad and to construct Raynham Park Station. Additional direct wetland impacts in Raynham would include 77 lf of Bank impact, 18,578 sf (0.4 acre) of BVW impact, and 76,126 sf (1.7 acres) of BLSF to Wetlands R 12.2 and R 12.1 (300), at Pine Swamp Brook, in the Pine Swamp area.

Reconstructing the existing inactive rail line in Raynham would result in permanent impact to 17 VWs, with a total of 58,628 sf (1.3 acres) of impact, and temporary impact to 21 VWs, with a total of 41,403 sf (1.0 acre) of impact. Two WW areas would be permanently impacted, with a total of 66,528 sf (1.5 acres) of impact, and four WW areas would be temporarily impacted, with a total of 3,639 sf (0.1 acre) of impact.

Raynham would have some of the largest direct wetland impacts along the project corridor. Blocked drainage ditches have forced water to travel down the right-of-way and formed a perennial stream (Wetland R 62.1). Relocating this stream to one side of the right-of-way would create impacts to 204 sf of VW and over 1.5 acres of WW to reconstruct the railroad and to construct Raynham Park Station. Additional direct impacts in Raynham would include fill to VWs in Wetlands R 12.2 and R 12.1 (0.4 acre) in Pine Swamp. Table 4.16-25 lists the impacted wetlands in Raynham and the size of each impacted area.

In response to comments on the DEIS/DEIR the feasibility of constructing a trestle through Pine Swamp was evaluated. The current design for the Stoughton Alternative includes an at-grade track structure through the Pine Swamp, utilizing the existing embankment to carry the proposed track. A trestle option similar to the structure proposed for the Hockomock Swamp was evaluated but was found to be not practicable based on cost and logistics.

Table 4.16-25 Direct Impacts to State and Federal Resource Areas–Raynham

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
Wetland ID	Perm. (lf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Perm. (sf)	New (sf)	Redev. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)
EA-63 (200)	-	4,813	3,163	-	-	32,900	-	-	-	-	-	4,813	3,163
EA-64 (500)	-	381	447	-	-	-	-	-	-	-	-	381	447
R-62.1	6,579	204	67	66,334	401	-	-	100,449	158,950	66,334	401	204	67
R-59	-	641	2,004	-	-	-	-	-	-	-	-	641	2,004
R-61	-	522	389	-	-	-	-	-	-	-	-	522	389
R-50	-	367	647	-	-	-	-	-	-	-	-	367	647
R-49	66	13,209	5,950	-	-	-	-	-	-	-	-	13,209	5,950
R-50 (100)	-	3,293	3,115	-	-	-	-	-	-	-	-	3,293	3,115
R-44	7	742	1,554	-	-	17,914	-	-	-	-	-	742	1,554
RWB-02 (100)	9	-	187	-	-	-	-	-	-	-	-	-	187
RWB-02 (300)	-	-	389	-	-	-	-	-	-	-	-	-	389
R-118	175	-	-	-	-	-	-	-	-	-	-	-	-
R-113	83	412	642	-	2,361	-	-	-	-	-	2,361	412	642
R-116	-	-	-	-	601	-	-	6,788	13,557	-	601	161	496
R-116	-	161	496	-	-	-	-	-	-				
R-116A	-	-	124	-	-	-	-	-	-	-	-	-	124
R-12.2	57	18,578	14,537	194	276	76,126	-	2,927	8,919	194	276	18,578	14,537
R-12.1 (300)	19	-	2,130	-	-	-	-	-	-	-	-	-	2,130
T-5	-	3,341	1,388	-	-	-	-	-	-	-	-	3,341	1,388
T-4	-	577	725	-	-	-	-	-	-	-	-	577	725
T-3	-	1,693	863	-	-	-	-	-	-	-	-	1,693	863
T-4.1	-	438	858	-	-	-	-	-	-	-	-	438	858
T-2	-	9,256	1,729	-	-	-	-	-	-	-	-	9,256	1,729
TOTAL	6,994	58,628	41,403	66,528	3,639	126,940	0	110,164	181,426	66,528	3,639	58,628	41,403
TOTAL (ac)		1.3	1.0	1.5	0.1	2.9	0.0	2.5	4.2	1.5	0.1	1.3	1.0

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Pine Swamp is a 275-acre wetland system located in western Raynham and consisting of several properties that are owned by the Town of Raynham Conservation Commission. The Stoughton Line crosses the swamp in a one-mile segment from King Phillip Street to East Britannia Street (Figures 4.16-1o and p). This area consists of forested and marsh wetlands known as Pine Swamp, an area that is located within estimated habitat of rare wetlands species, and which supports an Atlantic white cedar swamp community. Pine Swamp is currently fragmented by the former railroad bed, which acts as a barrier to aquatic organisms except at the two culverts. The swamp is also fragmented by the Taunton Municipal Light Corporation's overhead power line that is maintained as a cleared utility corridor parallel to the existing railroad embankment. The Taunton Municipal Light Corporation (TMLC) currently uses the embankment as access for maintenance of their overhead wires. With the proposed new rail in place, they would be required to use a high-rail vehicle to perform this function. A separate access road is not required and will not be constructed.

Pine Swamp is a small (relative to the Hockomock) wetland ecosystem that is not recognized as an ACEC or Important Bird Area. It does not have extensive vernal pool complexes adjacent to the existing elevated embankment or track bed, and does not support state-listed salamanders or turtles. The only state-listed species present is a butterfly (Hessel's hairstreak). The area immediately adjacent to the existing embankment is a power line where invasive species including common reed have become established.

The currently proposed At-Grade design would cost approximately $5 Million, and would result in permanent BVW impacts of approximately 18,600 square feet of wetland. Wildlife passage would be provided by reconstructing the two existing stream crossings with extended culverts (which provide a shelf or bank on either side of the waterway to allow a passage for non-aquatic wildlife), and by adding at least four wildlife underpasses. These wildlife underpasses will maintain travel passages for species that may be unable to cross the tracks (salamanders, frogs, turtles, small mammals) as well as enhance travel passages for small mammals that may be deterred from crossing an active rail line. Drift fences will be installed that will facilitate wildlife passage by directing movement to these underpasses.

A trestle structure, similar to the structure proposed for the Hockomock Swamp, would consist of two distinct cross sections – a 1,000-foot transition at each end and a central trestle structure, approximately 3,300 feet long. The transition would include a cast-in-place (CIP) retained fill section that would vertically transition from the standard at-grade track cross section to the trestle at a grade of one percent. The retained fill section has would have an overall width of 28 to 30 feet. The cast-in-place retaining walls would maintain a vertical barrier along each side of the track to minimize wetland impacts as the track profile rose up to the level of the trestle. The trestle would consist of a prestressed concrete superstructure. The overall width of the superstructure would be 21 feet, supported on pile caps spaced every 30 feet. The bottom of the superstructure would be approximately three feet above the existing track bed to allow for inspection and maintenance, which translates to the top of rail profile rising up above the existing embankment as much as 9.5 feet. This solution reduces wetland impacts to only those locations where the pier caps and transition retaining walls extend into the bordering vegetated wetlands.

The Trestle Option would cost approximately $50 Million, which includes engineering and construction costs. Other alternatives may be considered beyond the common bridge types, however it is not anticipated that any savings would be significant enough to make the trestle a viable option. This option would result in filling approximately 3,800 square feet of wetland.

Because Pine Swamp does not provide extraordinary biodiversity values, a trestle would not provide significant biodiversity or rare species benefits. The cost increase (ten times the cost of the At-Grade Alternative) is not warranted and the trestle is not practicable based on cost. Proposed wildlife crossing structures would mitigate for the effects of reconstructing the At-Grade Option, and the proposed Mechanically Stabilized Earth MSE retaining walls would minimize wetland impacts.

Taunton—In Taunton, the Stoughton alternative includes segments of both the Stoughton Line and the New Bedford Main Line. The New Bedford Main Line segment extends from Weir Junction to Cotley Junction. The two segments form one continuous track through Taunton approximately 4.7 miles long. Reconstructing the existing active and inactive rail lines in Taunton would result in permanent impact to BVW in 20 wetlands, with 63,313 sf (1.5 acres) of impact, and temporary impact to BVW in 24 wetlands, with 55,795 sf (1.3 acres) of impact, for a total of 119,108 sf (2.7 acres) of alteration to BVW. Bank would be permanently impacted in four locations, with a total of 468 lf of impact. LUW would be temporarily impacted in one wetland, with a total of 1,067 sf (<0.1 acre) of impact. BLSF would be permanently impacted in six locations, with a total of 33,290 sf (0.8 acre) of impact. RA would be permanently impacted in four locations, with a total of 55,523 sf (1.3 acres) of new development.

Taunton has some of the largest direct wetland impacts along the project corridor. Several wetlands have formed partially or mostly within the inactive right-of-way and would be impacted. Additional direct wetland impacts in Taunton would include 0.7 acre of RA and 0.5 acre of BLSF associated with the Taunton River (Wetlands TCM 1.2 and TR (Crossing 2)).

Reconstructing the existing active and inactive rail line in Taunton would result in permanent impact to 24 VWs, with a total of 83,685 sf (1.9 acres) of impact, and temporary impact to 27 VWs, with a total of 58,790 sf (1.3 acres) of impact. One WW would be temporarily impacted, with a total 1,067 sf (<0.1 acre) of impact. Taunton would have some of the largest direct wetland impacts along the project corridor. Several wetlands have formed partially or mostly within the inactive right-of-way and would be impacted. Table 4.16-26 lists the impacted wetlands in Taunton and the size of each impacted area.

Table 4.16-26 Direct Impacts to State and Federal Resource Areas–Taunton

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
Wetland ID	Perm. (lf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	New (sf)	Redev. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)
T-42 (100)	-	2,730	2,519	-	-	-	-	-	-	-	-	2,730	2,519
T-42 (200)	-	-	-	-	-	-	-	-	-	-	-	15,220	-
T-43	-	1,042	762	-	-	-	-	-	-	-	-	1,042	762
T-41.2	-	-	329	-	-	-	-	-	-	-	-	-	329
T-41.1	-	-	-	-	-	-	-	-	-	-	-	334	540
T-41.1.1	-	-	171	-	-	-	-	-	-	-	-	-	171-
T-43.2	2	-	-	-	-	-	-	-	-	-	-	-	-
T-41 (100)	-	3,173	2,167	-	-	-	-	-	-	-	-	3,173	2,167
T-40	-	-	-	-	1,067	-	-	-	-	-	1,067	-	-
T-39	-	-	-	-	-	-	-	-	-	-	-	416	467
T-37	-	476	1,474	-	-	1,738	-	-	-	-	-	476	1,474
T-34	-	3,008	2,489	-	-	4,498	-	-	-	-	-	3,008	2,489
T-33	-	198	662	-	-	-	-	-	-	-	-	198	662
MR	9	-	-	-	-	3,348	-	-	-	-	-	-	-
TCM-1	-	7,421	1,079	-	-	-	-	-	-	-	-	7,421	1,079
TCM-1.2	-	617	4,806	-	-	4,938	-	10,467	18,169	-	-	617	4,806
TCM-2WEST	-	865	2,202	-	-	-	-	-	-	-	-	865	2,202
TCM-1.1	-	-	563	-	-	1,554	-	-	-	-	-	-	563
TCM-3	-	-	-	-	-	-	-	-	-	-	-	4,403	1,987
TCM-5	-	6,299	1,204	-	-	-	-	-	-	-	-	6,299	1,204
TCM-7EAST (200)	-	7,038	2,652	-	-	-	-	-	-	-	-	7,038	2,652
TCM-6	-	8,299	12,030	-	-	-	-	-	-	-	-	8,299	12,030
TCM-7EAST (100)	-	3,173	4,955	-	-	-	-	-	-	-	-	3,173	4,955
TCM-7WEST	-	6,367	3,736	-	-	-	-	-	-	-	-	6,367	3,736
TCM-10WEST (200)	-	1,189	990	-	-	-	-	-	-	-	-	1,189	990
TCM-10WEST (100)	-	1,246	1,198	-	-	-	-	-	-	-	-	1,246	1,198
TCM-9	283	5,763	1,659	-	-	-	-	-	-	-	-	5,763	1,659

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
Wetland ID	Perm. (lf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	New (sf)	Redev. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)
TCM-12	-	665	1,155	-	-	-	-	-	-	-	-	665	1,155
TCM-11B	-	-	1,801	-	-	-	-	-	-	-	-	-	1,801
TCM-14 (200)	-	3,100	2,838	-	-	-	-	-	-	-	-	3,100	2,838
TR (Crossing 1)	-	-		-	-	-	-	15,866	8,983	-	-	-	-
TR (Crossing 2)	174	643	2,355	-	-	17,214	-	21,893	28,059	-	-	643	2,355
BKCM-5	-	-	-	-	-	-	-	7,297	13,512	-	-	-	-
TOTAL	468	63,313	55,795	0	1,067	33,290	0	55,523	68,722	0	0	83,685	58,790
TOTAL (ac)		1.5	1.3	0.0	<0.1	0.8	0.0	1.3	1.6	0.0	0.0	1.9	1.3

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Berkley—In Berkley, the Stoughton alternative includes segments of both the New Bedford Main Line and the Fall River Secondary, both of which currently have active freight service. The New Bedford Main Line has approximately 2.9 miles of right-of-way, while the Fall River Secondary Line has approximately 0.8 mile of right-of-way, for a total of approximately 3.7 miles of right-of-way in Berkley.

Reconstructing the existing active rail lines in Berkley would result in permanent impact to BVW in 14 wetlands, with 61,247 sf (1.4 acres) of impact, and temporary impact to BVW in 19 wetlands, with 42,056 sf (1.0 acre) of impact, for a total of 103,303 sf (2.4 acres) of alteration to BVW. Bank would be permanently impacted in two locations, with a total of 233 lf of impact. LUW would not be impacted. BLSF would be permanently impacted in two locations, with a total of 7,325 sf (0.2 acre) of impact. RA would be permanently impacted in four locations, with a total of 48,648 sf (1.1 acres) of new development.

The largest direct wetland impacts in Berkley are those associated with the Cotley River, which is bridged twice along the project corridor and also flows directly adjacent to the right-of-way for several hundred feet. Reconstructing the rail line would require widening the existing berm, impacting wetlands associated with the river. Direct wetland impacts associated with the Cotley River would include 1.0 acre of RA and 0.7 acre of BVW fill to four wetland areas (Wetlands BCKM 4 (100), BKCM 10 (200), BKCM 4 (400), and BKCM 18).

Reconstructing the existing active rail lines in Berkley would result in permanent impact to 14 VWs, with a total of 65,402 sf (1.5 acres) of impact, and temporary impact to 18 VWs, with a total of 42,057 sf (1.0 acre) of impact. No WW impacts would occur. The largest direct impacts in Berkley are in vegetated wetlands associated with the Cotley River, which is bridged by the tracks twice along the project corridor and also flows directly adjacent to the right-of-way for several hundred feet. Reconstructing the rail line would require widening the existing berm, causing impacts to wetlands associated with the river. Direct impacts associated with the Cotley River include 0.7 acre of fill to four VWs (Wetlands BCKM 4 (100), BKCM 10 (200), BKCM 4 (400), and BKCM 18). Table 4.16-27 lists the impacted wetlands in Berkley and the size of each impacted area.

Table 4.16-27 Direct Impacts to State and Federal Resource Areas–Berkley

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
Wetland ID	Perm. (lf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	New (sf)	Redev. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)
BKCM-5	-	-	-	-	-	-	-	6,951	13,613	-	-	-	-
TCM-14 (100)	-	4,210	2,049	-	-	-	-	-	-	-	-	4,210	2,049
BKCM-6	-	-	141	-	-	-	-	-	-	-	-	-	141
BKCM-1	-	712	793	-	-	-	-	-	-	-	-	712	793
BKCM-8	-	-	119	-	-	-	-	-	-	-	-	-	119
BKCM-4 (100)	202	10,926	7,614	-	-	1,881	-	25,208	36,723	-	-	10,926	7,614
BKCM-10 (200)	-	-	350	-	-	5,444	-	-	-	-	-	-	350
BKCM-4 (200)	-	-	120	-	-	-	-	-	-	-	-	-	120
BKCM-18.1	-	5,847	1,856	-	-	-	-	-	-	-	-	5,847	1,856
BKCM-4 (300)	-	1,335	1,430	-	-	-	-	-	-	-	-	1,335	1,430
BKCM-4 (400)	-	18,734	9,367	-	-	-	-	8,238	12,828	-	-	18,734	9,367
BKCM-18	-	295	4,294	-	-	-	-	8,251	15,201	-	-	295	4,294
BKCM-13	-	164	835	-	-	-	-	-	-	-	-	164	835
BKCM-20	-	700	3,246	-	-	-	-	-	-	-	-	700	3,246
BK-1.1	-	-	-	-	-	-	-	-	-	-	-	4,156	-
BK-1	31	9,903	4,178	-	-	-	-	-	-	-	-	9,903	4,178
BKN-1	-	-	-	-	-	-	-	-	-	-	-	-	-
BK-2B	-	5,963	1,721	-	-	-	-	-	-	-	-	5,963	1,721
BK-4	-	-	108	-	-	-	-	-	-	-	-	-	108
BK-7	-	414	1,336	-	-	-	-	-	-	-	-	414	1,336
LKF-2	-	2,043	2,500	-	-	-	-	-	-	-	-	2,043	2,500
TOTAL	233	61,247	42,056	0	0	7,325	0	48,648	78,365	0	0	65,402	42,057
TOTAL (ac)		1.4	1.0	0.0	0.0	0.2	0.0	1.1	1.8	0.0	0.0	1.5	1.0

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Lakeville—In Lakeville, the Stoughton alternative includes segments of both the New Bedford Main Line and the Fall River Secondary, both of which currently have active freight service. The New Bedford Main Line has approximately 3.5 miles of right-of-way, while the Fall River Secondary has approximately 0.3 mile of right-of-way, for a total of approximately 3.8 miles of right-of-way in Lakeville.

Reconstructing the existing active rail lines in Lakeville would result in permanent impact to BVW in 10 wetlands, with 34,442 sf (0.8 acre) of impact, and temporary impact to BVW in nine wetlands, with 23,382 sf (0.5 acre) of impact, for a total of 57,824 sf (1.3 acres) of alteration to BVW. Bank would be permanently impacted in three locations, with a total of 606 lf of impact. LUW would be temporarily impacted in one wetland, with a total of 829 sf (<0.1 acre) of impact. BLSF would be permanently impacted in one location, with a total of 2,623 sf (0.1 acre) of impact. RA would be permanently impacted in two locations, with a total of 33,439 sf (0.8 acre) of new development.

The largest direct wetland impacts in Lakeville are those associated with the Assonet Cedar Swamp area and the Cedar Swamp River. Wetland LK 7 would receive 0.5 acre of BVW fill and 0.6 acre of RA impact. Additional direct wetland impacts in Lakeville would include 0.2 acre of BVW fill to nine other wetland areas on the New Bedford Main Line and Fall River Secondary.

Reconstructing the existing active rail lines in Lakeville would result in permanent impact to 11 VWs, with a total of 34,563 sf (0.8 acre) of impact, and temporary impact to 10 VWs, with a total of 23,622 sf (0.5 acre) of impact. One WW would be temporarily impacted, with a total of 829 sf (<0.1 acre) of impact. The largest direct impacts in Lakeville would be in wetlands associated with the Assonet Cedar Swamp and the Cedar Swamp River. Wetland LK 7 would receive 0.5 acre of fill. Additional direct impacts in Lakeville would include 0.2 acre of fill to nine other VWs along the New Bedford Main Line and Fall River Secondary. Table 4.16-28 lists the impacted wetlands in Lakeville and the size of each impacted area.

Table 4.16-28 Direct Impacts to State and Federal Resource Areas–Lakeville

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
	Perm.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	New	Redev.	Perm.	Temp.	Perm.	Temp.
Wetland ID	**(lf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**
LK-4	-	2,499	1,503	-	-	-	-	-	-	-	-	2,499	1,503
LK-7	-	23,608	17,267	-	-	-	-	26,313	31,601	-	-	23,608	17,267
LK-7.1										-	-	121	238
LK-12.1	-	2,664	-	-	-	-	-	-	-	-	-	2,664	-
LK-13	-	178	416	-	-	-	-	-	-	-	-	178	416
LK-17.1	469	4,135	1,854	-	-	-	-	-	-	-	-	4,135	1,854
LK-19	-	126	76	-	-	-	-	-	-	-	-	126	76
LK-20	21	-	-	-	-	-	-	-	-	-	-	-	-
LKF-1	116	-	-	-	-	-	-	-	-	-	-	-	-
LKF-3.1	-	644	1,032	-	-	-	-	7,127	12,879	-	-	644	1,032
LKF-1 - LKF1.1	-	-	-	-	829	-	-	-	-	-	829	-	-
LKF-3	-	109	193	-	-	-	-	-	-	-	-	109	193
LKF-1.1	-	172	529	-	-	2,623	-	-	-		-	172	529
LKF-4	-	307	514	-	-	-	-	-	-	-	-	307	514
TOTAL	606	34,442	23,382	0	829	2,623	0	33,439	44,479	0	829	34,563	23,622
TOTAL (ac)		0.8	0.5	0.0	<0.1	0.1	0.0	0.8	1.0	0.0	<0.1	0.8	0.5

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Freetown—In Freetown, the Stoughton alternative includes segments of both the New Bedford Main Line and the Fall River Secondary, both of which currently have active freight service. The New Bedford Main Line has approximately 3.6 miles of right-of-way, while the Fall River Secondary Line has approximately 5.5 miles of right-of-way, for a total of approximately 9.1 miles of right-of-way in Freetown.

Reconstructing the existing active rail lines in Freetown would result in permanent impact to BVW in 17 wetlands, with 43,869 sf (1.0 acres) of impact, and temporary impact to BVW in 27 wetlands, with 24,465 sf (0.6 acre) of impact, for a total of 68,334 sf (1.6 acres) of alteration to BVW. Bank would be permanently impacted in 20 locations, with a total of 2,460 lf of impact. LUW would be permanently and temporarily impacted in two wetlands, with a total of 14,072 sf (0.3 acre) of permanent impact and 6,379 sf (0.1 acre) of temporary impact. BLSF would be permanently impacted in 11 locations, with a total of 12,435 sf (0.3 acre) of impact. RA would be permanently impacted in four locations, with a total of 42,223 sf (1.0 acre) of new development.

Direct wetland impacts in Freetown include four areas of BVW fill greater than 0.1 acre along the Fall River Secondary, including 0.3 acre of BVW fill to Wetland FRF 21, a wetland that has formed within the right-of-way. Impact to 0.5 acre of RA and 0.2 acre of BVW fill would occur to two wetland areas associated with the Cedar Swamp River (Wetlands FRF 2 and FRF 3 (100 series)). Reconstructing the rail bed would affect 1,592 lf of Bank impact as well as 0.3 acre of LUW fill to Wetlands FRF 11 and FRF 12, associated with Terry Brook Pond on both sides of the right-of-way (Fall River Secondary). One BVW (Wetland RFR-23.1.1) would be directly impacted from constructing the Freetown Station.

Reconstructing the existing active rail lines in Freetown would result in permanent impact to 19 VWs, with a total of 47,935 sf (1.1 acres) of impact, and temporary impact to 30 VWs, with a total of 25,913 sf (0.6 acre) of impact. Two WW areas would be permanently and temporarily impacted, with a total of 14,072 sf (0.3 acre) of permanent impact and 6,379 sf (0.1 acre) of temporary impact.

Direct impacts in Freetown would include fill in four VWs in amounts greater than 0.1 acre along the Fall River Secondary, including 0.3 acre of fill in Wetland FRF 21, a wetland that has formed within the right-of-way, and 0.2 acre of fill in two VWs associated with the Cedar Swamp River (Wetlands FRF 2 and FRF 3 (100 series)). Constructing the Freetown Station would impact one VW (Wetland RFR-23.1.1), for a total of 2,590 sf of permanent impact, and 565 sf of temporary impact. Additional impacts in Freetown include 0.3 acre of WW fill in Wetlands FRF 11 and FRF 12, associated with Terry Brook Pond on both sides of the Fall River Secondary right-of-way. Table 4.16-29 lists the impacted wetlands in Freetown and the size of each impacted area.

Table 4.16-29 Direct Impacts to State and Federal Resource Areas–Freetown

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
	Perm.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	New	Redev.	Perm.	Temp.	Perm.	Temp.
Wetland ID	(lf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)	(sf)
LK-21WEST (100)	26	-	139	-	-	151	-	-	-	-	-	-	139
LK-24										-	-	-	106
FRN-2	10	-	-	-	-	-	-	-	-	-	-	-	-
FRN-4	28	-	360	-	-	389	-	7,778	8,278	-	-	-	360
FRN-4.1	-	410	453	-	-	-	-	-	-	-	-	410	453
FRN-13	30	-	-	-	-	-	-	-	-	-	-	-	-
FRN-13.1	-	-	164	-	-	-	-	7,197	8,607	-	-	-	164
FRN-15	26	399	441	-	-	480	-	-	-	-	-	399	441
FRN-19	5	-	181	-	-	-	-	-	-	-	-	-	181
FRN-18	24	-	-	-	-	-	-	-	-	-	-	-	-
FRN-20	-	-	272	-	-	-	-	-	-	-	-	-	272
FRN-21	508	1,881	35	-	-	-	-	-	-	-	-	1,881	35
FRN-23	2	-	-	-	-	-	-	-	-	-	-	-	-
FRN-24										-	-	-	169
FRN-25	9	-	-	-	-	-	-	-	-	-	-	-	-
FRN-27	13	570	483	-	-	-	-	-	-	-	-	570	483
LKF-1	-	-	107	-	-	1,412	-	-	-	-	-	-	107
LKF-1A	-	638	335	-	-	-	-	-	-	-	-	638	335
FRF-1	-	-	461	-	-	-	-	-	-	-	-	-	461
FRF-1B	12	-	-	-	-	-	-	-	-	-	-	-	-
FRF-1A	21	-	-	-	-	-	-	-	-	-	-	-	-
FRF-2	23	7,711	4,295	-	-	-	-	-	-	-	-	-	-
FRF-3 (100)	24	2,296	1,675	-	-	1,436	-	22,444	37,307	-	-	2,296	1,675
FRF-4	-	4,238	2,909	-	-	-	-	-	-	-	-	4,238	2,909
FRF-8	-	1,421	1,106	-	-	-	-	-	-	-	-	1,421	1,106
FRF-6/FRN6	21	-	156	-	-	-	-	-	-	-	-	-	156
FRF-10	-	505	1,024	-	-	-	-	-	-	-	-	505	1,024
FRF-9	-	-	229	-	-	-	-	-	-	-	-	-	229
FRF-10.1.1	-	-	256	-	-	-	-	-	-	-	-	-	256

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
	Perm.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	New	Redev.	Perm.	Temp.	Perm.	Temp.
Wetland ID	**(lf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**	**(sf)**
FRF-10.2 (100)	35	-	-	-	-	-	-	-	-	-	-	-	-
FRF-11	862	-	-	9,490	3,400	1,025	-	-	-	9,490	3,400	-	-
FRF-12	730	-	-	4,582	2,979	3,449	-	-	-	4,582	2,979	-	-
FRF-19.1	-	-	-	-	-	-	-	-	-	-	-	232	330
FRF-19	-	2,867	1,038	-	-	-	-	-	-	-	-	2,867	1,038
FRF-23.2.1	-	305	276	-	-	-	-	-	-	-	-	305	276
FRF-23.1.1	-	2,590	565	-	-	-	-	-	-	-	-	2,590	565
FRF-21	-	13,500	2,854	-	-	-	-	-	-	-	-	13,500	2,854
FRF-26.3(A)	-	1,436	4,518	-	-	-	-	-	-	-	-	1,436	4,518
FRF-26.2(A)										-	-	939	-
FRF-26.2	-	4,527	-	-	-	-	-	-	-	-	-	4,527	-
FRF-26.1	-	-	222	-	-	-	-	-	-	-	-	-	222
FRF-26.1.1	-	1,470	754	-	-	-	-	-	-	-	-	1,470	754
FRF-29.2	52	-	-	-	-	996	-	-	-	-	-	-	-
LKF-1.1	-	-	-	-	-	788	-	-	-	-	-	-	-
FRF-A	-	-	-	-	-	872	-	4,804	10,121	-	-	-	-
FRF-29 (200)	-	-	-	-	-	1,436	-	-	-	-	-	-	-
TOTAL	2460	43,869	24,465	14,072	6,379	12,435	0	42,223	64,313	14,072	6,379	47,935	25,913
TOTAL (ac)		1.0	0.6	0.3	0.1	0.3	0.0	1.0	1.5	0.3	0.1	1.1	0.6

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

New Bedford—The New Bedford segment of the Stoughton alternative is approximately 7.0 miles long and has active freight service along the New Bedford Main Line. Reconstructing the existing active rail line in New Bedford would result in permanent impact to BVW in 13 wetlands, with 53,137 sf (1.2 acres) of impact, and temporary impact to BVW in 14 wetlands, with 33,168 sf (0.8 acre) of impact, for a total of 86,305 sf (2.0 acre) of alteration to BVW. Bank would be permanently impacted in four locations, with a total of 269 lf of impact. LUW would not be impacted. BLSF would be permanently impacted in one location, with a total of 1,494 sf (<0.1 acre) of impact. RA would not be impacted.

Direct wetland impacts in New Bedford would include four areas of BVW fill greater than 0.1 acre, including 0.4 acre of BVW fill to Wetland NBS, a narrow wetland along the side of the railroad berm, which would be filled to construct the King's Highway Station. Other areas of BVW fill would occur in more natural wetland areas, including 0.3 acre of BVW fill to Wetland NB 28.

Reconstructing the existing active rail line in New Bedford would result in permanent impact to 15 VWs, with a total of 52,601 sf (1.2 acres) of impact, and temporary impact to 16 VWs, with a total of 33,370 sf (0.8 acre) of impact. No WW impacts would occur. Direct impacts in New Bedford would include four areas of fill in VWs in amounts greater than 0.1 acre, including 0.4 acre of fill in Wetland NBS, a narrow wetland (a former drainage ditch) within the right-of-way that would be filled to construct the King's Highway Station. Other areas of fill in VWs occur in more natural areas, including 0.3 acre of fill in Wetland NB 28. Table 4.16-30 lists the impacted wetlands in New Bedford and the size of each impacted area.

Fall River—The Fall River segment of the Stoughton alternative is approximately 5.3 miles long and has active freight service along the Fall River Secondary. Reconstructing the existing active rail line in Fall River would not result in any permanent impact to BVW, and temporary impact to BVW in one wetland, with 154 sf (<0.1 acre) of impact. Coastal Bank would be permanently impacted in four locations, with a total of 274 lf of impact. LUW would not be impacted. LSCSF would be permanently impacted in three locations, with a total of 25,221 sf (0.6 acre) of impact. RA would not be impacted.

Fall River is the only municipality along the project corridor that would have Coastal Bank and LSCSF impacts in three areas, including 0.4 acre of FA 6B). These impacts are associated with the Taunton River.

Reconstructing the existing active rail line in Fall River would result in permanent impact to two VWs, with a total of 1,647 sf (<0.1 acre) of impact, and temporary impact to three VWs, with a total of 2,192 sf (0.1 acre) of impact. No WW impacts would occur. Table 4.16-31 lists the impacted wetlands in Fall River and the size of each impacted area.

Table 4.16-30 Direct Impacts to State and Federal Resource Areas–New Bedford

	Bank	BVW		LUW		BLSF	ILSF	RA[1]		Waterbody/Waterway		Vegetated Wetlands	
Wetland ID	Perm. (lf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	New (sf)	Redev. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)
NB-2	-	1,045	928	-	-	-	-	-	-	-	-	1,045	928
NB-6	-	2,012	1,010	-	-	-	-	-	-	-	-	2,012	1,010
NB-8	-	-	-	-	-	-	-	-	-	-	-	1,567	1,139
NB-10	-	7,067	3,822	-	-	-	-	-	-	-	-	7,067	3,822
NB-14	-	-	302	-	-	-	-	-	-	-	-		302
NB-15	-	4,695	242	-	-	-	-	-	-	-	-	4,695	242
NB-20	-	171	1,695	-	-	1,494	-	-	-	-	-	171	1,695
NB-22	-	1,043	2,859	-	-	-	-	-	-	-	-	1,043	2,859
NB-24	-	294	1,124	-	-	-	-	-	-	-	-	294	1,124
NB-23 (200)	-	1,925	6,032	-	-	-	-	-	-	-	-	1,925	6,032
NB-25	-	-	-	-	-	-	-	-	-	-	-	2,764	998
NB-23 (100)	-	5,299	6,526	-	-	-	-	-	-	-	-	5,299	6,526
NB-25.1	-	879	2,766	-	-	-	-	-	-	-	-	879	2,766
NBS (1)	-	724	386	-	-	-	-	-	-	-	-	724	386
NBS	-	16,176	1,140	-	-	-	-	-	-	-	-	16,176	1,140
NB-28	-	11,806	4,338	-	-	-	-	-	-	-	-	11,806	4,338
TOTAL	0	53,137	33,168	0	0	1,494	0	0	0	0	0	52,601	33,370
TOTAL (ac)		1.2	0.8	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	1.2	0.8

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 Riverfront Area is measured 25 feet from the edge of a resource area.

Table 4.16-31 Direct Impacts to State and Federal Resource Areas–Fall River

	Bank	BVW		LUW		BLSF	ILSF	RA[1]		Coastal Bank	LSCSF	Waterbody/Water way		Vegetated Wetlands	
Wetland ID	Perm. (lf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	New (sf)	Redev. (sf)	Perm. (lf)	Perm. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)
FRF-29.1	-	-	-	-	-	-	-	-	-	32	-	-	-	-	-
FA-1A	-	-	-	-	-	-	-	-	-	79	-	-	-	-	-
FA-3	-	-	154	-	-	-	-	-	-	60	524	-	-	-	154
FA-3A	-	-	-	-	-	-	-	-	-	103	-	-	-	1,021	417
B	-	-	-	-	-	-	-	-	-	-	-	-	-	626	1,034
Wetland 3	-	10,181	587	-	-	-	-	-	-	-	-	-	-	10,181	587
FA-5B	-	-	-	-	-	-	-	-	-	-	5,327	-	-	-	-
FA-6B	-	-	-	-	-	-	-	-	-	-	19,370	-	-	-	-
TOTAL	0	-	154	0	0	0	0	0	0	274	25,221	0	0	1,647	2,192
TOTAL (ac)		0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.0		0.6	0.0	0.0	<0.1	0.1

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 Riverfront Area is measured 25 feet from the edge of a resource area.

Summary of Direct Impacts to State and Federal Resource Areas—Reconstructing the existing active and inactive rail lines along the Stoughton alternative would result in permanent impact to BVW in 105 wetlands, with 9.6 acres of impact, and temporary impact to BVW in 131 wetlands, with 5.4 acres of impact, for a total of 15.0 acres of alteration to BVW. BVW impacts would result from reconstructing and widening existing berms associated with the rail lines, and filling wetlands that have formed within the right-of-way.

Bank would be permanently impacted in 46 locations, with a total of 16,813 lf of impact. The largest Bank impacts would occur in:

- Raynham (6,994 lf of impact), in order to relocate a perennial stream that has formed in the right-of-way due to blocked drainage ditches;
- Easton (5,423 lf of impact), due to an intermittent stream channel that flows down the right-of-way due to blocked drainage ditches; and
- Freetown (2,460 lf of impact), due to filling of Terry Brook Pond on both sides of the right-of-way.

LUW would be permanently impacted in four wetlands, with a total of 1.9 acres of impact, and temporarily impacted in nine wetlands, with a total of 0.3 acre of impact. LUW impacts would largely result mainly from relocating the perennial stream in Raynham and filling Terry Brook Pond in Freetown.

BLSF would be permanently impacted in 32 locations, with a total of 6.7 aces of impact. The largest BLSF impacts would occur in Raynham as a result of relocating the perennial stream.

RA would be permanently impacted in 22 locations, with a total of 7.9 acres of new development of naturally vegetated land outside of the existing ballast and other active rail elements. The largest RA impacts would occur in Raynham as a result of relocating the perennial stream.

Coastal Bank would be permanently impacted in four locations in Fall River, with a total of 274 lf of impact.

LSCSF would be permanently impacted in three locations in Fall River, with a total of 0.6 acre of impact, associated with the Taunton River.

Reconstructing the existing active and inactive rail lines along the project corridor would result in permanent impact to 121 VWs, with 10.4 acres of impact, and temporary impact to 148 VWs, with 5.6 acres of impact, for a total of 16.0 acres of alteration to VWs. Impacts to VWs would result from reconstructing and widening existing berms associated with the rail lines, and would impact wetlands that have formed within the right-of-way.

Four WW areas would be permanently impacted, with a total of 1.9 acres of impact, and nine WW areas would be temporarily impacted, with a total of 0.3 acre of impact. WW impacts would result mainly from relocating a perennial stream that has formed within the right-of-way in Raynham due to blocked drainage culverts, and filling portions of Terry Brook Pond in Freetown on both sides of the right-of-way in order to widen the existing berm.

Table 4.16-32 summarizes the direct impacts to state and federal wetland resource areas along the Stoughton Alternative corridor. The number of impacted wetlands and the total size of the impact for each type of resource area are given for each municipality.

Direct Impacts to Wetlands in an ACEC

Several resource areas along the Stoughton alternative occur in an Area of Critical Environmental Concern (ACEC). ACECs receive special recognition because of the quality, uniqueness, and significance of natural and cultural resources. ACECs are designated by the office of the Secretary of Energy and Environmental Affairs. Massachusetts wetland regulations at 310 CMR 10.55(4)(c) state that "Any proposed work shall not destroy or otherwise impair any portion of a Bordering Vegetated Wetland that is within an Area of Critical Environmental Concern." MassDOT does not anticipate that the South Coast Rail project can be constructed in full compliance with this performance standard. A Variance will be sought for the project because there are several performance standards for BVW and other resource areas that cannot be met.

The Stoughton alternative crosses the Hockomock Swamp ACEC in Easton and Raynham. Within the Hockomock Swamp ACEC, six wetlands would be directly impacted by the project. This includes the perennial stream that has formed within the right-of-way in Raynham.

Reconstructing the existing inactive rail line in Easton and Raynham would result in permanent impact to BVW in five wetlands, with 6,561 sf (0.2 acre) of impact, and temporary impact to BVW in six wetlands, with 6,287 sf (0.1 acre) of impact, for a total of 12,848 sf (0.3 acre) of alteration to BVW. Bank would be permanently impacted in one location, for a total of 6,579 lf of impact. LUW would be permanently and temporarily impacted in one wetland, with a total of 66,334 sf (1.5 acres) of permanent impact and 401 sf (<0.1 acre) of temporary impact. BLSF would be permanently impacted in one location, for a total of 32,900 sf of impact. RA would be permanently impacted in one location, for a total of 100,449 sf (2.3 acres) of impact. The majority of the BVW impacts would occur as a result of widening the existing berm to reconstruct the inactive rail line along Wetland EA 63 (200). The entirety of the Bank, LUW, and RA impacts would result from relocating the perennial stream that has formed within the right-of-way in Raynham.

Table 4.16-33 lists the wetlands that are directly impacted in the Hockomock Swamp ACEC, along with the type and amount of each impact.

Table 4.16-32 Summary of Direct Impacts to State and Federal Resource Areas

Municipality	Bank Perm. (#/lf)	BVW Perm. (#/ac)	BVW Temp. (#/ac)	LUW Perm. (#/ac)	LUW Temp. (#/ac)	BLSF[1] Perm. (#/ac)	ILSF[1] Temp. (#/ac)	RA New (#/ac)	RA Redev. (#/ac)	Coastal Bank Perm. (#/lf)	LSCSF Perm. (#/ac)	Waterbody/Waterway Perm. (#/ac)	Waterbody/Waterway Temp. (#/ac)	Vegetated Wetlands Perm. (#/ac)	Vegetated Wetlands Temp. (#/ac)
Canton	2/90	2/<0.1	2/<0.1	-	1/<0.1	5/0.9	-	1/0.4	1/0.5	-	-	-	1/<0.1	2/<0.1	4/<0.1
Stoughton	3/539	6/2.0	5/0.1	-	-	1/0.7	-	-	-	-	-	-	-	8/2.1	6/0.1
Easton	4/5,423	9/0.3	13/0.2	-	-	2 /0.8	-	4/0.8	4/1.2	-	-	-	-	11/0.4	15/0.2
Raynham	8/6,994	17/1.3	21/1.0	2/1.5	4/0.1	3/2.9	-	3/2.5	3/4.2	-	-	2/1.5	4/0.1	17/1.3	21/1.0
Taunton	4/468	20/1.5	24/1.3	-	1/<0.1	6/0.8	-	4/1.3	4/1.6	-	-	-	1/<0.1	24/1.9	27/1.3
Berkley	2/233	13/1.4	18/1.0	-	-	2/0.2	-	4/1.1	4/1.8	-	-	-	-	14/1.5	18/1.0
Lakeville	3/606	10/0.8	9/0.5	-	1/<0.1	1/0.1	-	2/0.8	2/1.0	-	-	-	1/<0.1	11/0.8	10/0.5
Freetown	20/ 2,460	15/1.0	25/0.6	2/0.3	2/0.1	11/0.3	-	4/1.0	4/1.5	-	-	2/0.3	2/0.1	19/1.1	30/0.6
New Bedford	-	13/1.2	14/0.8	-	-	1/<0.1	-	-	-	-	-	-	-	13/1.2	14/0.8
Fall River	-	-	1/<0.1	-	-	-	-	-	-	4/274	3/0.6	-	-	2/<0.1	3/0.1
TOTAL	46/ 16,813	105 /9.6	132/5.4	4/1.9	9/0.3	32/6.7	0/0.0	22/7.9	22/11.7	4/274	3/0.6	4/1.9	9/0.3	121/10.4	148/5.6

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 BLSF and ILSF were withdrawn from the ANRAD applications for the municipalities of Stoughton and Easton, and therefore neither resource area was confirmed by the Conservation Commissions from either municipality. Information for these resource areas is presented here for informational purposes and is approximate.

Table 4.16-33 Direct Impacts to Wetlands in the Hockomock Swamp ACEC

Wetland ID	Bank Perm. (lf)	BVW Perm. (sf)	BVW Temp. (sf)	LUW Perm. (sf)	LUW Temp. (sf)	BLSF Perm. (sf)	ILSF Temp. (sf)	RA[1] New (sf)	RA[1] Redev. (sf)
EA-77	-	-	217	-	-	-	-	-	-
EA-63 (200)	-	4,813	3,163	-	-	32,900	-	-	-
EA-64 (500)	-	381	447	-	-	-	-	-	-
R-62.1	6,579	204	67	66,334	401	-	-	100,449	158,950
R-59	-	641	2,004	-	-	-	-	-	-
R-61	-	522	389	-	-	-	-	-	-
TOTAL	6,579	6,561	6,287	66,334	401	32,900	0	100,449	158,950
TOTAL (ac)		0.2	0.1	1.5	<0.1	0.8	0.0	2.3	3.6

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Direct Impacts by Cover Type

This section quantifies and discusses the direct impacts to vegetation cover types along the Stoughton Alternative. Totals of each cover type will be used when determining mitigation goals. Using the analysis methods previously described, direct impacts were calculated to Cowardin cover types in each municipality along the right-of-way:

- Palustrine Forested (PFO);
- Palustrine Scrub-Shrub (PSS);
- Palustrine Emergent Marsh (PEM); and
- Open Water (OW).

These cover types encompass the state resource areas of BVW, LUW, and ILSF, as well as the federal resource areas of AFW, IFW, and WW. Impacts were further calculated for PFO subtypes of Wooded Swamp Deciduous (WSD) and Wooded Swamp Mixed (WSM), and PEM subtypes of Shallow Marsh (SM) and Deep Marsh (DM). The subtypes were obtained from MassGIS data layers showing cover type; however, where direct observation showed different conditions than the data layer, the direct observation data were used. Impacts were then totaled for each municipality as a whole.

Table 4.16-34 gives a summary of the direct impacts to cover types along the Stoughton Alternative corridor. The number of impacted wetlands and the total size of the impact for each cover type are given for each municipality. Totals for the entire length of the project are also given. The direct impacts to the cover types in each municipality are presented below.

Table 4.16-34 Direct Impacts by Cover Type–Stoughton Alternative

			OW		PEM				PSS		PFO			
	Total of All Types		Open Water		Shallow Marsh		Deep Marsh		Scrub-Shrub		WSD		WSM	
Municipality	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)
Canton	2/<0.1	5/0.1	-	1/<0.1	-	1/<0.1	-	-	-	1/<0.1	2/<0.1	2/<0.1	-	-
Stoughton	8/2.1	6/0.1	-	-	2/<0.1	2/<0.1	-	-	-	-	6/2.0	4/0.1	-	-
Easton	11/0.4	15/0.2	-	-	-	-	2/<0.1	3/<0.1	3/0.3	3/<0.1	6/0.1	9/0.1	-	-
Raynham	19/ 2.9	25/1.0	2/1.5	4/0.1	-	-	1/<0.1	1/<0.1	3/<0.1	4/0.1	12/1.3	14/0.8	1/<0.1	2/<0.1
Taunton	24/1.9	28/1.4	-	1/<0.1	4/0.6	4/0.2	-	-	-	-	20/1.3	23/1.2	-	-
Berkley	14/1.5	18/1.0	-	-	-	-	-	-	2/0.2	2/0.1	11/1.1	15/0.8	1/0.1	1/<0.1
Lakeville	11/0.8	11/0.6	-	1/<0.1	-	-	-	-	2/0.1	1/<0.1	9/0.7	9/0.5	-	-
Freetown	21/1.4	32/0.7	2/0.3	2/0.1	2/<0.1	2/0.1	-	-	5/0.2	7<0.1	12/0.9	21/0.4	-	-
New Bedford	13/1.2	14/0.8	-	-	1/0.4	1 <0.1	-	-	1<0.1	1/0.1	10/0.8	10/0.6	1 <0.1	2/0.1
Fall River	2/<0.1	3/0.1	-	-	-	-	-	-	-	-	2/<0.1	3/0.1	-	-
TOTAL	125/12.3	157/5.9	4/1.9	9/0.3	9/1.0	10/0.3	3/<0.1	4/0.1	16/0.9	19/0.4	90/8.3	110/4.7	3/0.2	5/0.1

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
PFO Subgroups: WSD = Wooded Swamp Deciduous, WSM = Wooded Swamp Mixed trees.

Reconstructing the existing active rail line in Canton would result in permanent and temporary impact to PFO in two wetlands, with a total of 1,200 square feet (sf) (<0.1 acre) of permanent impact and 1,436 sf (<0.1 acre) of temporary impact. All PFO impacts are of the subtype WSD. PSS would be temporarily impacted in one wetland, with a total of 303 sf (<0.1 acre) of impact. PEM would be temporarily impacted in one wetland, with a total of 310 sf (<0.1 acre) of impact. All PEM impacts are of the subtype SM. OW would be temporarily impacted in one wetland, with a total of 229 sf (<0.1 acre) of impact.

Reconstructing the existing active and inactive rail line in Stoughton would result in permanent impact to PFO in six wetlands, with a total of 86,184 sf (2.0 acres) of impact, and temporary impact to PFO in four wetlands, with a total of 5,417 sf (0.1 acre) of impact. All PFO impacts are of the subtype WSD. PSS would not be impacted. PEM would be permanently and temporarily impacted in two wetlands, with a total of 1,545 sf (<0.1 acre) of permanent impact and 1,087 sf (<0.1 acre) of temporary impact. All PEM impacts are of the subtype SM. OW would not be impacted.

Reconstructing the existing inactive rail line in Easton would result in permanent impact to PFO in six wetlands, with a total of 2,784 sf (0.1 acre) of impact, and temporary impact to PFO in nine wetlands, with a total of 5,388 sf (0.1 acre) of impact. All PFO impacts are of the subtype WSD. PSS would be permanently and temporarily impacted in three wetlands, with a total of 14,198 sf (0.3 acre) of permanent impact and 2,081 (<0.1 acre) of temporary impact. PEM would be permanently impacted in two wetlands, with a total of 1,151 sf (<0.1 acre) of impact, and temporarily impacted in three wetlands, with a total of 1,796 sf (<0.1 acre) of impact. All PEM impacts are of the subtype DM. OW would not be impacted. No direct impacts would occur to any Atlantic white cedar areas in the Hockomock Swamp because the tracks would be on an elevated trestle through the swamp.

Reconstructing the existing inactive rail line in Raynham would result in permanent impact to PFO in 12 wetlands, with a total of 56,685 sf (1.3 acres) of impact, and temporary impact to BVW in 14 wetlands, with a total of 35,322 sf (0.8 acre) of impact. PFO impacts are nearly all of the subtype WSD, except for 412 sf (<0.1 acre) of permanent and 766 sf (<0.1 acre) of temporary WSM impact. PSS would be permanently impacted in three wetlands, with a total of 1,367 sf (<0.1 acre), and temporarily impacted in four wetlands, with a total of 4,590 sf (0.1 acre) of impact. PEM would not be impacted. OW would be permanently impacted in two wetlands, with a total of 66,528 sf (1.5 acres) of impact, and temporarily impacted in four wetlands, with a total of 3,639 sf (0.1 acre) of impact. No areas of Atlantic white cedar present in the Hockomock Swamp or the Pine Swamp would be impacted.

Reconstructing the existing active and inactive rail line in Taunton would result in permanent impact to PFO in 20 wetlands, with a total of 58,326 sf (1.3 acres) of impact, and temporary impact to BVW in 23 wetlands, with a total of 51,443 sf (1.2 acres) of impact. All PFO impacts are of the subtype WSD. PSS would not be impacted. PEM would be permanently and temporarily impacted in four wetlands, with a total of 25,359 sf (0.6 acre) of permanent impact and 7,346 sf (0.2 acre) of temporary impact. All PEM impacts are of the subtype SM. OW would be temporarily impacted in one wetland, with a total of 1,067 sf (<0.1 acre) of impact.

Reconstructing the existing active rail lines in Berkley would result in permanent impact to PFO in 11 wetlands, with a total of 48,825 sf (1.1 acres) of impact, and temporary impact to PFO in 15 wetlands, with a total of 35,366 sf (0.8 acre) of impact. PFO impacts are nearly all of the subtype WSD, except for 5,963 sf (0.1 acre) of permanent and 1,721 sf (<0.1 acre) of temporary WSM impact. PSS would be permanently and temporarily impacted in two wetlands, with a total of 10,214 sf (0.2 acre) of permanent impact and 4,608 sf (0.1 acre) of temporary impact. PEM and OW would not be impacted.

Reconstructing the existing active rail lines in Lakeville would result in permanent impact to PFO in nine wetlands, with a total of 31,592 sf (0.7 acre) of impact, and temporary impact to PFO in nine wetlands, with a total of 23,106 sf (0.5 acre) of impact. All PFO impacts are of the subtype WSD. PSS would be permanently impacted in two wetlands, with a total of 2,971 sf (0.1 acre) of impact, and temporarily impacted in one wetland, with a total of 514 sf (<0.1 acre) of impact. PEM would not be impacted. OW would be temporarily impacted in one wetland, with a total of 829 sf (<0.1 acre) of impact. No areas of Atlantic white cedar, present in the Assonet Cedar Swamp, would be impacted.

Reconstructing the existing active rail lines in Freetown would result in permanent impact to PFO in 12 wetlands, with a total of 35,248 sf (0.9 acre) of impact, and temporary impact to PFO in 21 wetlands, with a total of 17,683 sf (0.4 acre) of impact. All PFO impacts are of the subtype WSD. PSS would be permanently impacted in five wetlands, with a total of 8,395 sf (0.2 acre) of impact, and temporarily impacted in seven wetlands, with a total of 2,071 sf (<0.1 acre) of impact. PEM would be permanently and temporarily impacted in two wetlands, with a total of 1,667 sf (<0.1 acre) of permanent impact and 4,848 sf (0.1 acre) of temporary impact. All PEM impacts are of the subtype SM. OW would be permanently and temporarily impacted in two wetlands, with a total of 14,072 sf (0.3 acre) of permanent impact and 6,379 sf (0.1 acre) of temporary impact.

Reconstructing the existing active rail line in New Bedford would result in permanent impact to PFO in 10 wetlands, with a total of 34,504 sf (0.8 acre) of impact, and temporary impact to PFO in 10 wetlands, with a total of 26,303 sf (0.6 acre) of impact. PFO impacts are nearly all of the subtype WSD, except for 1,043 sf (<0.1 acre) of permanent and 3,160 sf (0.1 acre) of temporary WSM impact. PSS would be permanently and temporarily impacted in one wetland, with a total of 879 sf (<0.1 acre) of permanent impact and 2,766 sf (0.1 acre) of temporary impact. PEM would be permanently and temporarily impacted in one wetland, with a total of 16,176 sf (0.4 acre) of permanent impact and 1,140 sf (<0.1 acre) of temporary impact. PEM impacts are all of the subtype SM. No areas of Atlantic white cedar, present in the Acushnet Cedar Swamp, would be impacted.

Reconstructing the existing active rail line in Fall River would result in permanent impact to PFO in two wetlands, with a total of 1,647 sf (<0.1 acre) of impact, and temporary impact to PFO in three wetlands, with a total of 2,192 sf (0.1 acre) of impact. PFO impacts are all of the subtype WSD. PSS and PEM would not be impacted.

In summary, reconstructing the existing active and inactive rail lines along the Stoughton alternative would result in permanent impact to PFO in 93 wetlands, with 8.5 acres of impact, and temporary impact to PFO in 115 wetlands, with 4.8 acres of impact, for a total of 13.3 acres of alteration to PFO (Table 4.16-34).

PSS would be permanently impacted in 16 wetlands, with a total of 0.9 acres of impact, and temporarily impacted in 19 wetlands, with a total of 0.4 acres of impact. The largest PSS impacts are associated with Wetland EA 12.1 in Easton, a narrow wetland area that has formed within the right-of-way.

PEM would be permanently impacted in 12 wetlands, with a total of 1.0 acre of impact, and temporarily impacted in 14 wetlands, with a total of 0.4 acres of impact. The largest PEM impacts are associated with Wetland T 42 (200) in Taunton, an emergent wetland that has formed within the right-of-way.

OW would be permanently impacted in four wetlands, with a total of 1.9 acres of impact, and temporarily impacted in nine wetlands, with a total 0.3 acres of impact. The largest OW impacts would occur in Wetland R 62.1 in Raynham, in order to relocate a perennial stream that has formed in the

right-of-way due to blocked drainage ditches, and in Wetlands FRF 11 and FRF 12 in Freetown, where Terry Brook Pond occurs on both sides of the right-of-way.

Direct Impacts to Jurisdictional Wetlands/Waters by Watershed

The Stoughton Alternative crosses the Neponset, Taunton, Buzzards Bay, and Narragansett Bay regional watersheds. Direct impacts to jurisdictional wetlands/waters that fall within each watershed were calculated to help guide the development of mitigation measures. The majority of the project corridor falls within the Taunton regional watershed. Of the approximately 52.1 miles of the total rail length of the project, approximately 39.9 miles lie in the Taunton watershed, 4.7 miles in the Neponset watershed, 6.8 miles in the Buzzards Bay watershed, and 0.7 mile in the Narragansett Bay watershed. The majority of direct impacts also occur in the Taunton watershed. A total of 102 of the 123 wetlands that would be permanently impacted are in the Taunton watershed, with 9.1 of the 10.7 acres of total permanent impact. A total of 128 of the 151 wetlands that would be temporarily impacted are also in the Taunton watershed, with 4.7 of the 5.6 acres of total temporary impact. In the Neponset watershed, three wetlands would be permanently and temporarily impacted, with a total of less than 0.1 acre of permanent impact and less than 0.1 acre of temporary impact. In the Buzzards Bay watershed, 15 wetlands would be permanently impacted, with a total of 1.3 acres of impact, and 16 wetlands would be temporarily impacted, with a total of 0.8 acre of impact. In the Narragansett Bay watershed, three wetlands would be permanently and temporarily impacted, with 0.2 acre of permanent impact and less than 0.1 acre of temporary impact. Impacts to Outstanding Resource Waters (ORWs) include those wetlands associated with vernal pools. A detailed discussion of vernal pool impacts is provided in Chapter 4.14, *Biodiversity, Wildlife and Vegetation*. Table 4.16-35 lists the watersheds in the South Coast Rail project corridor, the number of wetlands impacted in each, and the amount of each impact.

Table 4.16-35 Direct Impacts to Vegetated Wetlands by Watershed

Watershed	Waterbody/Waterway		Adjacent Federal Wetlands		Isolated Federal Wetlands		ORW Impacts	
	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)
Neponset	-	1/<0.1	2/<0.1	4/<0.1	-	-	-	-
Taunton	4/1.9	8/0.3	91/8.3	113/4.6	13/0.8	14/0.1	26/1.5	32/1.5
Buzzards Bay	-	-	13/1.2	14/0.8	-	-	-	-
Narragansett Bay	-	-	-	1/<0.1	2/<0.1	2/<0.1	-	-
TOTAL	**4/1.9**	**9/0.3**	**106/9.6**	**132/5.4**	**15/0.8**	**16/0.1**	**26/1.5**	**32/1.5**

Stoughton Diesel

Impacts to wetlands for the Stoughton Diesel Alternative are similar to the impacts identified above for the Stoughton Electric Alternative. The diesel alternative does not require traction power substations and would result in approximately 0.01 acre of permanent wetland impacts less than the Stoughton Electric Alternative along the New Bedford Main Line. All other impacts are the same as those estimated for the remainder of Stoughton Electric Alternative.

Whittenton Electric Alterative

The Whittenton Electric Alternative is a variant of the Stoughton Electric Alternative alignment described in the section on the Stoughton Electric Alternative. Specifically, at Raynham Junction near the southern end of the historic Stoughton Line, the alignment would divert to the southwest, following the old Whittenton Branch (Figures 4.16-4a-j). This alignment would connect with the Attleboro Secondary at Whittenton Junction in Taunton, and then continue southeast to connect with the New Bedford Main Line at Weir Junction, at the northern end of the Southern Triangle. Service along the southernmost portion of the Stoughton Line, from Raynham Junction to Weir Junction, would not be reestablished if this variant were selected. The Southern Triangle portion of the project is common to all alternatives and requires the rail bed, track, and signals along the existing Fall River Secondary and New Bedford Main Lines to be upgraded for passenger rail traffic. This portion of the project extends from Cotley Junction in Taunton along the New Bedford Main Line through Berkley, Lakeville, Freetown, and New Bedford and along the Fall River Secondary from Myricks Junction in Lakeville through Freetown and Fall River (Figures 4.16-2a-q and 4.16-3a-j).

This alternative would include Battleship Cove Station, Canton Center Station, Canton Junction Station, Dana Street Station, Easton Village Station, Fall River Depot Station, Freetown Station, King's Highway Station, North Easton Station, Raynham Park Station, South Station, Stoughton Station, Taunton Depot Station, and Whale's Tooth Station. The alternative includes two layover facilities (Weaver's Cove East on the Fall River Secondary and Wamsutta on the New Bedford Main Line. Potential impacts to wetland resources resulting from developing the new stations and layover facilities are inclusive and not discussed separately.

No construction would be required along the Northeast Corridor and the existing Stoughton Line commuter rail track from Canton Junction to Stoughton would be upgraded for the Whittenton Electric Alternative. New track would be installed on the existing embankment from Stoughton south to Raynham Junction. Similar to the Stoughton alternative a section from Foundry Street in Easton to Raynham Station through the Hockomock Swamp would be constructed on an elevated trestle (Figures 4.16-2k and l). Canopy clearing would be required along the right-of-way where the elevated trestle would be located within the Hockomock Swamp to accommodate additional height requirements associated with the trestle. Canopy clearing generally occurs within upland forest, though portions would occur in wetland resources. Canopy clearing would not result in additional impacts to wetland resources as this work would occur in uplands.

The alignment of the proposed Whittenton Alternative follows a previously developed railroad corridor. Although the rail corridor has been established, necessary track improvements would result in the loss of wetland resources along the right-of-way. The following sections describe both direct and indirect impacts as they relate to this alternative.

Direct Impact to State and Federal Resource Areas by Municipality

With the exception of those impacts within Raynham and Taunton, the direct impacts to state resources for the Whittenton Alternative are the same as those reported previously for the Stoughton alternative.

For the towns of Canton, Stoughton, Easton, Berkley, Lakeville, and Freetown, and the cities of New Bedford and Fall River, the impacts to State and Federal Resources are as reported for the Stoughton Electric Alternative, in Tables 4.16-32, above.

This section also quantifies and discusses the federal waters of the United States (including wetlands) affected by the Whittenton Alternative. These waters are assumed jurisdictional under Section 404 of the Clean Water Act. They are also regulated at the state level by 314 CMR 9.00, which implements the Federal Clean Water Act Section 401 Water Quality Certification program for a discharge of dredged or fill material.

Using the analysis methods described previously, direct impacts (both permanent and temporary) were calculated to federal wetlands in each municipality. Impacts were totaled for each municipality as a whole. The direct impacts to federal wetlands in each municipality are presented below. As previously described, some small isolated wetlands within the project corridor are assumed to be jurisdictional under Section 404.

Raynham—The Raynham segment of the Whittenton alternative includes approximately 2.8 miles along an inactive portion of the Stoughton Line and approximately 1.2 miles along an inactive portion of the Whittenton Branch. Reconstructing the existing inactive rail line in Raynham would result in permanent impact to BVW in 9 wetlands, with 24,172 sf (0.5 acre) of impact, and temporary impact to BVW in 12 wetlands, with 18,081 sf (0.4 acre) of impact for a total of 42,253 sf (1.0 acre) of alteration to BVW. Bank would be permanently impacted in five locations, with a total of 6,773 lf of impact. LUW would be permanently impacted in one wetland with a total of 66,334 sf (1.5 acres) of impact, and temporarily impacted in the same wetland, with a total of 401 sf (<0.1 acre) of impact. BLSF would be permanently impacted in two locations, with a total of 50,814 sf (1.2 acres) of impact. RA would be permanently impacted in one location, with a total of 100,449 sf (2.3 acres) of new development. The Whittenton Alternative avoids impacts in the Pine Swamp area.

The Whittenton Alternative would result in permanent impact to nine VWs, with a total of 24,172 sf (0.6 acre) of impact, and temporary impact to 12 VWs, with a total of 18,081 sf (0.4 acre) of impact. One WW area would be impacted, with a permanent impact of 66,334 sf (1.5 acres) and a temporary impact of 401 sf (<0.1 acre). Table 4.16-36 lists the impacted wetlands in Raynham and the size of each impacted area.

Table 4.16-36 Direct Impacts to State and Federal Resource Areas–Raynham

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
Wetland ID	Perm. (lf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Perm. (sf)	New (sf)	Redev. (sf)	Perm. (sf)	Temp. (sf)	Perm. (sf)	Temp. (sf)
EA-63 (200)	-	4,813	3,163	-	-	32,900	-	-	-	-	-	4,813	3,163
EA-64 (500)	-	381	447	-	-	-	-	-	-	-	-	381	447
R-62.1	6,579	204	67	66,334	401	-	-	100,449	158,950	66,334	401	204	67
R-59	-	641	2,004	-	-	-	-	-	-	-	-	641	2,004
R-61	-	522	389	-	-	-	-	-	-	-	-	522	389
R-50	-	367	647	-	-	-	-	-	-	-	-	367	647
R-49	66	13,209	5,950	-	-	-	-	-	-	-	-	13,209	5,950
R-50 (100)	-	3,293	3,115	-	-	-	-	-	-	-	-	3,293	3,115
R-44	7	742	1,554	-	-	17,914	-	-	-	-	-	742	1,554
RWB-02 (100)	9	-	187	-	-	-	-	-	-	-	-	-	187
RWB-02 (300)	-	-	389	-	-	-	-	-	-	-	-	-	389
RWB-02.1	112	-	169	-	-	-	-	-	-	-	-	-	169
TOTAL	6,773	24,172	18,081	66,334	401	50,814	-	100,449	158,950	66,334	401	24,172	18,081
TOTAL (ac)		0.5	0.4	1.5	<0.1	1.2	-	2.3	3.6	1.5	<0.1	0.6	0.4

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Taunton—In Taunton, the Whittenton alternative includes approximately 2.2 miles along an inactive portion of the of the Whittenton Branch, a 2.4 mile segment of the active Attleboro Secondary, as well as, a portion of the New Bedford Main Line from Weir Junction to Cotley Junction. Reconstructing the existing active and inactive rail lines in Taunton would result in permanent impact to BVW in 15 wetlands, with 53,145 sf (1.2 acres) of impact, and temporary impact to BVW in 17 wetlands, with 46,040 sf (1.1 acres) of impact, for a total of 99,185 sf (2.3 acres) of alteration to BVW. Bank would be permanently impacted in two locations, with a total of 457 lf of impact. LUW would not be impacted. BLSF would be permanently impacted in three locations, with a total of 32,706 sf (0.8 acre) of impact. RA would be permanently impacted in five locations, with a total of 61,390 sf (1.4 acres) of new development.

Taunton has some of the largest direct wetland impacts along the project corridor. Several wetlands have formed partially or mostly within the inactive right-of-way and would be impacted. Additional direct wetland impacts in Taunton would include 0.7 acre of RA and 0.5 acre of BLSF associated with the Taunton River (Wetlands TCM 1.2 and TR (Crossing 2)).

Reconstructing the existing active and inactive rail line in Taunton would result in permanent impact to 17 VWs, with a total of 71,326 sf (1.6 acres) of impact, and temporary impact to 19 VWs, with a total of 50,015 sf (1.1 acres) of impact. Taunton would have some of the largest direct wetland impacts along the project corridor. Several wetlands have formed partially or mostly within the inactive right-of-way and would be impacted. Table 4.16-37 lists the impacted wetlands in Taunton and the size of each impacted area.

Table 4.16-37 Direct Impacts to State and Federal Resource Areas–Taunton

	Bank	BVW		LUW		BLSF	ILSF	RA		Waterbody/Waterway		Vegetated Wetlands	
Wetland ID	**Perm. (lf)**	**Perm. (sf)**	**Temp. (sf)**	**Perm. (sf)**	**Temp. (sf)**	**Perm. (sf)**	**Temp. (sf)**	**New (sf)**	**Redev. (sf)**	**Perm. (sf)**	**Temp. (sf)**	**Perm. (sf)**	**Temp. (sf)**
TWB-04	-	460	817	-	-	-	-	-	-	-	-	460	817
TWB-06/07	-	-	-	-	-	-	-	5,867	24,490	-	-	-	-
TWB-08.1	-	-	-	-	-	-	-	-	-	-	-	13,778	1,988
TCM-1	-	7,421	1,079	-	-	-	-	-	-	-	-	7,421	1,079
TCM-1.2	-	617	4,806	-	-	4,938	-	10,467	18,169	-	-	617	4,806
TCM-2WEST	-	865	2,202	-	-	-	-	-	-	-	-	865	2,202
TCM-1.1	-	-	563	-	-	1,554	-	-	-	-	-	-	563
TCM-3	-	-	-	-	-	-	-	-	-	-	-	4,403	1,987
TCM-5	-	6,299	1,204	-	-	-	-	-	-	-	-	6,299	1,204
TCM-7EAST (200)	-	7,038	2,652	-	-	-	-	-	-	-	-	7,038	2,652
TCM-6	-	8,299	12,030	-	-	-	-	-	-	-	-	8,299	12,030
TCM-7EAST (100)	-	3,173	4,955	-	-	-	-	-	-	-	-	3,173	4,955
TCM-7WEST	-	6,367	3,736	-	-	-	-	-	-	-	-	6,367	3,736
TCM-10WEST (200)	-	1,189	990	-	-	-	-	-	-	-	-	1,189	990
TCM-10WEST (100)	-	1,246	1,198	-	-	-	-	-	-	-	-	1,246	1,198
TCM-9	283	5,763	1,659	-	-	-	-	-	-	-	-	5,763	1,659
TCM-12	-	665	1,155	-	-	-	-	-	-	-	-	665	1,155
TCM-11B	-	-	1,801	-	-	-	-	-	-	-	-	-	1,801
TCM-14 (200)	-	3,100	2,838	-	-	-	-	-	-	-	-	3,100	2,838
TR (Crossing 1)	-	-		-	-	-	-	15,866	8,983	-	-	-	-
TR (Crossing 2)	174	643	2,355	-	-	17,214	-	21,893	28,059	-	-	643	2,355
BKCM-5	-	-	-	-	-	-	-	7,297	13,512	-	-	-	-
TOTAL	457	53,145	46,040	0	0	32,706	0	61,390	93,212	0	0	71,326	50,015
TOTAL (ac)		1.2	1.1	0.0	0.0	0.8	0.0	1.4	2.1	0.0	0.0	1.6	1.1

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

Summary of Direct Impacts to State and Federal Resource Areas—Reconstructing the existing active and inactive rail lines along the Whittenton alternative would result in permanent impact to BVW in 92 wetlands, with 8.4 acres of impact, and temporary impact to BVW in 117 wetlands, with 4.7 acres of impact, for a total of 13.1 acres of alteration to BVW. BVW impacts would result from reconstructing and widening existing berms associated with the rail lines, and filling wetlands that have formed within the right-of-way. The majority of impacts are to one wetland, Wetland TWB 08.1, just south of Bay Street in the Taunton section of the Whittenton Branch. While a large portion of this wetland would be filled in order to construct the railroad, this is a disturbed, mainly unvegetated wetland that has developed within the right-of-way due to compression of soils from ATV and other use of the path. The area is isolated and does not provide wetland functions and values other than a minor amount of groundwater recharge through infiltration into sections of former drainage ditches along either side of the right-of-way.

Bank would be permanently impacted in 41 locations, with a total of 16,581 lf of impact. The largest Bank impacts would occur in:

- Raynham (6,773 lf of impact);
- Easton (5,423 lf of impact); and
- Freetown (2,460 lf of impact).

LUW would be permanently impacted in three wetlands, with a total of 1.8 acres of impact, and temporarily impacted in five wetlands, with a total of 0.2 acre of impact. LUW impacts would largely result mainly from relocating the perennial stream in Raynham and filling Terry Brook Pond in Freetown.

BLSF would be permanently impacted in 28 locations, with a total of 5.0 acres of impact. The largest BLSF impacts would occur in Raynham as a result of relocating the perennial stream.

RA would be permanently impacted in 21 locations, with a total of 7.8 acres of new development of naturally vegetated land outside of the existing ballast and other active rail elements. The largest RA impacts would occur in Raynham as a result of relocating the perennial stream.

Coastal Bank would be permanently impacted in four locations in Fall River, with a total of 274 lf of impact.

LSCSF would be permanently impacted in three locations in Fall River, with a total of 0.6 acres of impact, associated with the Taunton River.

Reconstructing the existing active and inactive rail lines along the project corridor would result in permanent impact to 106 VWs, with 9.4 acres of impact, and temporary impact to 131 VWs, with 4.9 acres of impact, for a total of 14.3 acres of alteration to VWs. Impacts to VWs would result from reconstructing and widening existing berms associated with the rail lines, and would impact wetlands that have formed within the right-of-way.

Three WW areas would be permanently impacted, with a total of 1.8 acres of impact, and five WW areas would be temporarily impacted, with a total of 0.2 acre of impact. WW impacts would result mainly from relocating a perennial stream that has formed within the right-of-way in Raynham due to blocked

drainage culverts, and filling portions of Terry Brook Pond in Freetown on both sides of the right-of-way in order to widen the existing berm.

Table 4.16-38 summarizes the direct impacts to state and federal wetland resource areas along the Whittenton Alternative corridor. The number of impacted wetlands and the total size of the impact for each type of resource area are given for each municipality.

Direct Impacts to Wetlands in an ACEC

Similar to the Stoughton alternative, the Whittenton alternative crosses the Hockomock Swamp ACEC in Easton and Raynham. Within the Hockomock Swamp ACEC, six wetlands would be directly impacted by the project. This includes the perennial stream that has formed within the right-of-way in Raynham. Table 4.16-33 lists the wetlands that are directly impacted in the Hockomock Swamp ACEC, along with the type and amount of each impact.

Direct Impacts by Cover Type

This section quantifies and discusses the direct impacts to vegetation cover types along the Whittenton Alternative. Totals of each cover type will be used when determining mitigation goals. Direct impacts were calculated to Cowardin cover types in each municipality along the right-of-way. Using the analysis methods previously described.

Table 4.16-39 gives a summary of the direct impacts to cover types along the Whittenton corridor. The number of impacted wetlands and the total size of the impact for each cover type are given for each municipality. Totals for the entire length of the project are also given. The direct impacts to the cover types in each municipality are presented below.

Table 4.16-38 Direct Impacts to State and Federal Resource Areas along the Whittenton Alternative

	Bank	BVW		LUW		BLSF1	ILSF1	RA		Coastal Bank	LSCSF	Waterbody/Water way		Vegetated Wetlands	
Municipality	Perm. (#/lf)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	New (#/ac)	Redev. (#/ac)	Perm. (#/lf)	Perm. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)
Canton	2/90	2/<0.1	2/<0.1	-	1/<0.1	5/0.9	-	1/0.4	1/0.5	-	-	-	1/<0.1	2/<0.1	4/<0.1
Stoughton	3/539	6/2.0	5/0.1	-	-	1/0.7	-	-	-	-	-	-	-	8/2.1	6/0.1
Easton	4/5,423	9/0.3	13/0.2	-	-	2/0.8	-	4/0.8	4/1.2	-	-	-	-	11/ 0.4	15/0.2
Raynham	5/6,773	9/0.5	12/0.4	1/1.5	1/<0.1	2/1.2	-	1/2.3	1/3.6	-	-	1/1.5	1/<0.1	9/0.6	12/0.4
Taunton	2/457	15/1.2	18/1.1	-	-	3/0.8	-	5/1.4	5/2.1	-	-	-	-	17/1.6	19/1.1
Berkley	2/233	13/1.4	18/1.0	-	-	2/0.2	-	4/1.1	4/1.8	-	-	-	-	14/1.5	18/1.0
Lakeville	3/606	10/0.8	9/0.5	-	1/<0.1	1/0.1	-	2/0.8	2/1.0	-	-	-	1/<0.1	11/0.8	10/0.5
Freetown	20/2,460	15/1.0	25/0.6	2/0.3	2/0.1	11/0.3	-	4/1.0	4/1.5	-	-	2/0.3	2/0.1	19/1.1	30/0.6
New Bedford	-	13/1.2	14/0.8	-	-	1/<0.1	-	-	-	-	-	-	-	13/1.2	14/0.8
Fall River	-	-	1/<0.1	-	-	-	-	-	-	4/274	3/0.6	-	-	2/<0.1	3/<0.1
TOTAL	41/16,581	92/8.4	117/4.7	3/1.8	5/0.2	28 /5.0	0/0.0	21/7.8	21/11.7	4/274	3/0.6	3/1.8	5/0.2	106/9.4	131/4.9

Notes: Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 BLSF and ILSF were withdrawn from the ANRAD applications for the municipalities of Stoughton and Easton, and therefore neither resource area was confirmed by the Conservation Commissions from either municipality. Information for these resource areas is presented here for informational purposes and is approximate.

Table 4.16-39 Direct Impacts by Cover Type–Whittenton Alternative

			OW		PEM				PSS		PFO			
	Total of All Types		Open Water		Shallow Marsh		Deep Marsh		Scrub-Shrub		WSD		WSM	
Municipality	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)
Canton	2/<0.1	5/0.1	-	1/<0.1	-	1/<0.1	-	-	-	1/<0.1	2/<0.1	2/<0.1	-	-
Stoughton	8/2.1	6/0.1	-	-	2/<0.1	2/<0.1	-	-	-	-	6/2.0	4/0.1	-	-
Easton	11/0.4	15/0.2	-	-	-	-	2/<0.1	3/<0.1	3/0.3	3/<0.1	6/0.1	9/0.1	-	-
Raynham	10/2.1	13/0.4	1/1.5	1/<0.1	-	-	-	1/<0.1	3/<0.1	3/0.1	6/0.5	8/0.4	-	-
Taunton	17/1.6	19/1.1	-	-	1/0.1	1/0.1					16/1.5	18/1.1		
Berkley	14/1.5	18/1.0	-	-	-	-	-	-	2/0.2	2/0.1	11/1.1	15/0.8	1/0.1	1/<0.1
Lakeville	11/0.8	11/0.6	-	1/<0.1	-	-	-	-	2/0.1	1/<0.1	9/0.7	9/0.5	-	-
Freetown	21/1.4	32/0.7	2/0.3	2/0.1	2/ <0.1	2/0.1	-	-	5/0.2	7 <0.1	12/0.9	21/0.4	-	-
New Bedford	13/1.2	14/0.8	-	-	1/0.4	1 <0.1	-	-	1 <0.1	1/0.1	10/0.8	10/0.6	1 <0.1	2/0.1
Fall River	2/<0.1	3/0.1	-	-	-	-	-	-	-	-	2/<0.1	3/0.1	-	-
TOTAL	109/11.2	136/5.1	3/1.8	5/0.2	6/0.6	7/0.3	2/<0.1	4/<0.1	16/0.9	18/0.3	80/7.7	99/4.1	2/0.2	3/0.1

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
PFO Subgroups: WSD = Wooded Swamp Deciduous, WSM = Wooded Swamp Mixed trees.

In comparison to the impacts previously discussed for the Stoughton Alternative, all impacts are the same with the exceptive of two municipalities, Raynham and Taunton. Reconstructing the existing inactive rail lines in Raynham would result in permanent impact to PFO in six wetlands, with a total of 0.5 acre of impact, and temporary impact to BVW in eight wetlands, with a total of 0.4 acre of impact. PFO impacts are all of the subtype WSD. PSS would be permanently impacted in three wetlands, with a total of <0.1 acre, and temporarily impacted in three wetlands, with a total of 0.1 acre of impact. PEM would not be permanently impacted. OW would be permanently impacted in one wetland, with 1.5 acres of impact, and temporarily impacted in one wetland, with <0.1 acre of impact. No areas of Atlantic white cedar present in the Hockomock Swamp would be impacted.

Reconstructing the existing active and inactive rail lines in Taunton would result in permanent impact to PFO in 16 wetlands, with a total of 1.5 acres of impact, and temporary impact to BVW in eight wetlands, with a total of 0.4 acre of impact. All PFO impacts are of the subtype WSD. The majority of impacts are to one wetland, Wetland TWB 08.1, just south of Bay Street in the Taunton section of the Whittenton Branch. This wetland has developed within the right-of-way and a large portion would be filled in order to construct the railroad. Although this wetland has been classified as palustrine forested area, this is a disturbed, mainly unvegetated wetland that has developed within the right-of-way due to compression of soils from ATV and other use of the path. The area is isolated and does not provide wetland functions and values other than a minor amount of groundwater recharge through infiltration into sections of former drainage ditches along either side of the right-of-way. PSS would not be impacted. PEM would be permanently impacted in one wetland with a total of 0.1 acre of impact and temporarily impacted in one wetland with 0.1 acre of temporary impact. All PEM impacts are of the subtype SM. OW would not be impacted.

In summary, reconstructing the existing active and inactive rail lines along the Whittenton alternative would result in permanent impact to PFO in 82 wetlands, with 7.9 acres of impact, and temporary impact to PFO in 102 wetlands, with 4.2 acres of impact, for a total of 12.1 acres of alteration to PFO (Table 4.16-39).

PSS would be permanently impacted in 16 wetlands, with a total of 0.9 acre of impact, and temporarily impacted in 18 wetlands, with a total of 0.3 acre of impact. The largest PSS impacts are associated with Wetland EA 12.1 in Easton, a narrow wetland area that has formed within the right-of-way.

PEM would be permanently impacted in 8 wetlands, with a total of 0.6 acre of impact, and temporarily impacted in 11 wetlands, with a total of 0.3 acre of impact. The largest PEM impacts are associated with Wetland T 42 (200) in Taunton, an emergent wetland that has formed within the right-of-way

OW would be permanently impacted in three wetlands, with a total of 1.8 acres of impact, and temporarily impacted in five wetlands, with a total 0.2 acres of impact. The largest OW impacts would occur in Wetland R 62.1 in Raynham, in order to relocate a perennial stream that has formed in the right-of-way due to blocked drainage ditches, and in Wetlands FRF 11 and FRF 12 in Freetown, where Terry Brook Pond occurs on both sides of the right-of-way.

Direct Impacts to Wetlands/Waters by Watershed

The Whittenton Alternative crosses the Neponset, Taunton, Buzzards Bay, and Narragansett Bay regional watersheds. Direct impacts to vegetated wetlands that fall within each watershed were calculated to help guide the development of mitigation measures. The majority of the project corridor falls within the Taunton regional watershed. Of the approximately 52.1 miles of the total rail length of

the project, approximately 39.9 miles lie in the Taunton watershed, 4.7 miles in the Neponset watershed, 6.8 miles in the Buzzards Bay watershed, and 0.7 mile in the Narragansett Bay watershed. The majority of direct impacts also occur in the Taunton watershed. A total of 87 of the 106 wetlands that would be permanently impacted are in the Taunton watershed, with 8.1 of the 9.4 acres of total permanent impact. A total of 108 of the 133 wetlands that would be temporarily impacted are also in the Taunton watershed, with 4.0 of the 4.8 acres of total temporary impact. In the Neponset watershed, three wetlands would be permanently and temporarily impacted, with a total of less than 0.1 acre of permanent impact and less than 0.1 acre of temporary impact. In the Buzzards Bay watershed, 15 wetlands would be permanently impacted, with a total of 1.3 acres of impact, and 16 wetlands would be temporarily impacted, with a total of 0.8 acre of impact. In the Narragansett Bay watershed, two wetlands would be permanently impacted with less than 0.1 acre of impact and three wetlands would be temporarily impacted, with 0.1 acre of impact. Impacts to Outstanding Resource Waters (ORWs) include those wetlands associated with vernal pools. A detailed discussion of vernal pool impacts is provided in Chapter 4.14, *Biodiversity, Wildlife and Vegetation*. Table 4.16-40 lists the watersheds in the South Coast Rail project corridor, the number of wetlands impacted in each, and the amount of each impact.

Table 4.16-40 Direct Impacts to Wetlands/Waters by Watershed

	Waterbody/Waterway		Vegetated Wetlands		ORW Impacts	
Watershed	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)	Perm. (#/ac)	Temp. (#/ac)
Neponset	-	1/<0.1	2/<0.1	4/<0.1	-	-
Taunton	3/1.8	4/0.2	87/8.1	108/4.0	17 /1.1	21/1.3
Buzzards Bay	-	-	15/1.3	16/0.8	-	-
Narragansett Bay	-	-	2/<0.1	3/0.1	-	-
TOTAL	3/1.8	5/0.2	106/9.4	131/4.9	17/1.1	21/1.3

Whittenton Diesel Alternative

Impacts to wetlands for the Whittenton Diesel Alternative are similar to the impacts identified above for the Whittenton Electric Alternative. The diesel alternative does not require traction power substations and would result in approximately 0.01 acre of permanent wetland impacts less than the Whittenton Electric Alternative along the New Bedford Main Line. All other impacts are the same as those estimated for the remainder of Whittenton Electric Alternative.

4.16.9.3 Secondary and/or Indirect Impact Analysis

As described in Section 4.16.6.2 the Secondary and/or Indirect Impact Analysis evaluated the effects of the alternatives on wetland functions and values for all wetlands within 100 feet of the project limits for the Stoughton and Whittenton alternatives. These impacts cannot be quantified, but are presented in a qualitative approach that identifies, for each wetland, the principal functions and values provided by that wetland, the magnitude of impact to those functions based on the physical extent of the impacts in comparison to the overall size of the wetland.

Secondary and/or indirect effects are changes in the ability of a wetland to provide each function, and do not affect a wetland uniformly (except for some small wetlands). These functional effects occur as gradients with the highest intensity occurring closest to the disturbance and decreasing with distance.

Each resource affected may also experience the effects differently – for example, the effects of a canopy gap do not affect all wildlife species in the same way, or at the same distance. While some researchers have considered a secondary effect ("road effect") to alter the entire wetland, others have documented that the effects of highways are not uniformly distributed across a wetland. Effects on the ability of a wetland to support production export are different in type and location than on the ability of a wetland to provide sediment/toxicant retention or nutrient transformation. Eigenbrod et al.[33] have shown that the ability of a wetland to provide wildlife habitat functions is multivariate, and includes size, edge: interior ratio, cover type, connectivity, microhabitat diversity, soil moisture, and other factors. Their work has shown that the most important variable is wetland size, and that changes in wetland size in small wetlands has a much greater effect on wildlife species richness than changes in size in larger wetlands.

For these reasons, the analysis of secondary and/or indirect effects has estimated the severity of the effect of the South Coast Rail project (reconstructing out-of-service rail infrastructure, reconstructing active rail infrastructure, adding infrastructure necessary for electric service, and constructing stations) on each adjacent or nearby wetland by ranking the impact based on the relative extent of impact in comparison to the overall size of the wetland, for each key function or value provided by that wetland.

Wetlands within 100 feet of the South Coast Rail project could experience secondary and/or temporary impacts to wetland functions as a result of the permanent loss of a portion of the wetland, temporary impacts resulting from construction, and/or proximity to the project. These impacts would differ, for some resources, depending on whether the adjacent project area is an active rail corridor or out-of-service.

Active Rail Segments

Active rail segments are characterized by a developed (ballasted) rail bed and tracks, which create a canopy gap and barrier to wildlife movement. Work proposed along these segments would improve wildlife passage by reconstructing bridges and culverts, and installing between-the-tie crossings to accommodate smaller fauna such as amphibians, but would not change the characteristics of the upland. The only effects of the proposed project would be to increase train passage and a minor increase in noise levels due to the increased number of trains.

The physical characteristics of those wetlands within 100 feet of the project limit-of-work not directly affected by construction would not change. The increased train passage is not anticipated to adversely affect the wildlife habitat function of adjacent or nearby wetlands (see Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*).

The introduction of the overhead catenary system required for the Electric Alternatives could affect the visual quality of wetlands, where there are views of the wetland from a public way or across a navigable waterway. There could be a negligible effect on the ability of waterways to provide fish habitat as a result of tree clearing within 25 feet of the bank.

Secondary and/or indirect effects to physical and biochemical functions (groundwater recharge, sediment/toxicant retention, flood storage, nutrient retention/transformation, production export) are

[33] Eigenbrod, F., S.J. Hecnor, and L. Fahrig. 2009. Quantifying the road-effect zone: threshold effects of a motorway on anuran populations in Ontario, Canada. Ecology and Society 14:24. Available online at: http://www.ecologyandsociety.org/vol14/iss1/art24.

related to the loss of the wetland that provides these functions, and impacts would be proportionate to the size of the lost area relative to the total wetland size. Areas of temporary construction impact would be restored to the same elevation and re-vegetated, with no loss of wetland function for these physical and biochemical functions. In general, reductions in sediment/toxicant/pathogen removal and nutrient removal/transformation would result from a reduced opportunity for sediment trapping, reduced vegetation/water interspersion, and changes in the type and density of vegetation. The ability of a wetland to provide production export would be affected by reduction in wildlife food sources, reduced wildlife usage, and a potentially reduced diversity of wetland plants.

Secondary effects to wildlife habitat functions would result from a loss of wetland that provides wildlife habitat function, or from canopy removal in forested wetlands as the canopy edge effects would extend further into the wetland. The loss of a portion of a wetland would reduce the effective habitat size for all species, and more so for forest interior species. These effects would be exacerbated by the barrier and noise effects. Barrier effects (and creation of a canopy gap that reduces the size of forest interior habitat) would result in the reduction of effective contiguous habitat size for populations of some species (especially reptiles, amphibians, some small mammals, some forest interior birds) as documented in Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*.

Areas of temporary impact would be restored, but create the potential for establishment of invasive species such as common reed or reed canary-grass (*Phalaris arundinacea*) that reduce wetland habitat quality in the impacted area and can spread throughout the wetland. Where the wetland is a vernal pool, or contains vernal pool habitat, the same effects occur and further reduce the wildlife habitat functions through the reduction of effective habitat size. The loss of vegetation on the rail berm within vernal pool supporting upland habitat could affect the population size of vernal pool amphibians. Reconstructing the rail infrastructure in some upland areas could affect the habitat of state-listed rare species (turtles, blue-spotted salamanders) in some wetlands.

Impacts to fisheries habitat would occur only where fill would be placed in pond or other waterway/waterbody with fisheries value, or where removing vegetation from or near a riverbank could affect shading. Impacts to recreational functions would occur where fill would be placed in pond or other waterway/waterbody accessible to/used for fishing.

Out-of-Service Rail Segments

Out-of-service rail segments are characterized by a developed (ballasted) rail bed, but also have a closed canopy in some areas and no tracks or ties remaining in place between Short Street in Easton and Longmeadow Road in Taunton. Work proposed along these segments would improve wildlife passage by reconstructing bridges and culverts, but would result in a barrier to the movement of some terrestrial wildlife species, and would increase the canopy gap in forested areas.

The physical characteristics of those wetlands within 100 feet of the project limit-of-work not directly affected by construction would not change. As a result no secondary or indirect effects to wetland functions or values would be anticipated (groundwater recharge, sediment/toxicant retention, flood storage, nutrient removal/transformation, production export, uniqueness/heritage).

The increased train passage is not anticipated to adversely affect the wildlife habitat function of adjacent or nearby wetlands (see Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*). The introduction of the overhead catenary system could affect the visual quality of wetlands, where there are views of the wetland from a public way or across a navigable waterway.

Secondary effects to wetland wildlife habitat, where this is a principal function, would occur as a result of the barrier and noise effects. Barrier effects (and creation of a canopy gap that reduces the size of forest interior habitat) would result in the reduction of effective contiguous habitat size for populations of some species (especially reptiles, amphibians, some small mammals, some forest interior birds) as documented in Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*. In Hockomock Swamp, the proposed trestle structure would largely eliminate the barrier effect. The loss of vegetation on the rail berm within vernal pool supporting upland habitat could affect the population size of vernal pool amphibians. However, it should be noted that re-establishment of commuter rail service would eliminate use of the right-of-way by ATV users that currently and regularly leave the right-of-way to enter, cross through, and/or ride in circuitous or serpentine pathways through the vernal pools, adversely affecting amphibians in those pools, particularly at breeding, egg and larval life stages. Preventing these occurrences would presumably enhance vernal pool habitat, thereby increasing populations of vernal pool amphibians–including some that are state-listed. Thus re-establishment of commuter rail service could actually have a secondary *benefit* to vernal pool wetlands, particularly in Hockomock Swamp. However, reconstructing the rail infrastructure in some upland areas could affect the habitat of state-listed rare species (turtles, blue-spotted salamanders) in some wetlands that provide the rare species habitat function.

Other secondary effects to wetlands that are in proximity to the project alternatives include the educational use of wetlands. Reconstructing the rail bed south of Foundry Street in Easton may affect the visual quality and access to wetlands that are used by faculty and students from the Southeast Regional Vocational and Technical School to supplement in-class learning. In locations where the out-of-service right-of-way is used as a trail and/or crossed by trails, reconstructing the track infrastructure would prevent hikers or ATV users from using the right-of-way or crossing the right-of-way to access recreational areas. The proximity to the overhead catenary could also affect the visual quality of some recreational areas adjacent to the right-of-way. All of these wetlands are adjacent to the Vocational and Technical school or residences and are not open for hunting. It should be noted, however that there are no mapped designated or sanctioned trails in Stoughton, Easton, or Raynham on or across the right-of-way that would be affected, notwithstanding *de facto* usage of the right-of-way for these purposes.

Many wetlands adjacent to the right-of-way provide habitat for state-listed reptile or amphibian species. Although the actual wetland habitat would not be directly affected, construction could have a secondary effect on the endangered species functions of these wetlands by creating a barrier to the movement of small vertebrates, although in Hockomock Swamp, the proposed trestle structure would largely eliminate the barrier effect. Similar to active sections of the rail, secondary and/or indirect effects to physical and biochemical functions (groundwater recharge, sediment/toxicant retention, flood storage, nutrient retention/transformation, production export) are related to the loss of the wetland that provides these functions, and impacts would be proportionate to the size of the lost area relative to the total wetland size. Areas of temporary construction impact would be restored to the same elevation and re-vegetated, with no loss of wetland function for these physical and biochemical functions.

Secondary effects to wildlife habitat functions would result from a loss of wetland that provides wildlife habitat function, or from canopy removal in forested wetlands as the canopy edge effects would extend further into the wetland. The loss of a portion of a wetland would reduce the effective habitat size for all species, and more so for forest interior species. These effects would be exacerbated by the barrier and noise effects. Barrier effects (and creation of a canopy gap that reduces the size of forest interior habitat) would result in the reduction of effective contiguous habitat size for populations of some

species (especially reptiles, amphibians, some small mammals, and some forest interior birds) as documented in Chapter 4.14, *Biodiversity, Wildlife and Vegetation*.

Areas of temporary impact would be restored but create the potential for establishment of invasive species such as common reed or reed-canary grass that reduce wetland habitat quality in the impacted area and can spread throughout the wetland. Where the wetland is a vernal pool, or contains vernal pool habitat, the same effects occur and further reduce the wildlife habitat functions through the reduction of effective habitat size. The loss of vegetation on the rail berm within vernal pool supporting upland habitat could affect the population size of vernal pool amphibians. Reconstructing the rail infrastructure in some upland areas could affect the habitat of state-listed rare species (Blanding's turtle (*Emydoidea blandingii*) and blue spotted salamander (*Ambystoma laterale*) eastern box turtle (*Terrapene carolina carolina*)) in some wetlands that provide the rare species habitat function. Impacts to fisheries habitat would occur only where fill would be placed in pond or other waterway/waterbody with fisheries value.

Temporary wetland impacts would have similar secondary and/or indirect effects on wetlands adjacent to out-of-service rail segments as for active rail segments. Secondary effects to wildlife habitat functions would result from the temporary loss of wetland that provides wildlife habitat function, or from canopy removal in forested wetlands as the canopy edge effects would extend further into the wetland. The change in wetland vegetation would reduce the effective habitat size for all species, more so for forest interior species. Areas of temporary impact would be restored but create the potential for establishment of invasive species such as common reed or reed-canary grass that reduce wetland habitat quality in the impacted area and can spread throughout the wetland. Where the wetland is a vernal pool, or contains vernal pool habitat, the same effects occur and further reduce the wildlife habitat functions.

Other Secondary and/or Indirect Effects

Other categories of secondary and/or indirect effects include effects caused by extending or relocating culverts that convey streams, and the potential effects of changes in stormwater discharge from the proposed commuter rail stations. Where culverts would be required to be extended or relocated, the changes to the wetland outlet have the potential to result in secondary effects to the physical as well as biological characteristics of wetlands. Changes to the outlet of a wetland could alter the duration or depth of flood storage, change discharge rates (that would affect downstream wetlands), or result in channel modifications upstream or downstream of the culvert.

Culverts are proposed to be retained without modification in the majority of areas, or reconstructed to meet to meet engineering requirements for operation of the South Coast Rail (per industry standards for railroad use) and, where appropriate (based on hydrology and ecological value), the Massachusetts Stream Crossing Standards.[34] Where culverts are proposed to be reconstructed to meet these standards, culvert extension is not proposed and the appropriate hydrological studies would be undertaken prior to final design to ensure that the upstream and downstream hydrology was not altered.

[34] River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards. The University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration-Riverways Program, American Rivers, and others. August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

Effects of stormwater discharges on wetlands have been minimized since all stations have been designed to comply with the Massachusetts Stormwater Standards. Stormwater collection and treatment systems would reduce the discharge of total suspended solids (TSS) and other contaminants, and would reduce discharge rates through the use of infiltration basins and bioretention swales. However, increased flows into or through the wetland, and potential increased discharge of TSS and other contaminants, could affect stream channels through erosion and/or deposition, alter vegetation or facilitate the introduction of invasive species. Functions affected could include bank stabilization, sediment/toxicant retention, production export, and wildlife habitat. Stormwater discharge would be likely to affect up to ten wetlands.

Stoughton Alternative

As shown in Table 4.16-41, the majority of wetlands along either the active or inactive segments of the Stoughton alternative would experience negligible to minor impacts to functions and values. In most cases, the wetlands are relatively large in comparison to the area in which functions would be lost or altered, and there would be little overall effect on the ability of the wetland to provide these functions. As shown in the table, the functions most affected would be wildlife habitat, with 116 of the 144 wetlands providing this function affected. Most of these (77 percent) would experience negligible or minor impacts. Although wetlands along both the active and inactive segments would experience a decrease in their ability to support wildlife habitat functions, including rare species habitat, these changes would be greater in the inactive segments due to the barrier effect of the reconstructed tracks. The segment through the Hockomock Swamp would result in a minor effect on wildlife habitat through creation of a canopy gap although there would be no barrier to wildlife movement. The overhead catenary system required to provide electric rail service would affect 58 wetlands that provide visual or aesthetic value, a majority of the wetlands that provide this function.

Table 4.16-41 Secondary and/or Indirect Effects on Wetlands within 100 feet of the Rail Segments along the Stoughton Alternative[1]

		Negligible/Minor		Moderate/High		
Function	Total Wetlands[2]	Active	Out-of-Service	Active	Out-of-Service	Total[3]
Groundwater recharge/discharge	339	0	0	0	0	10
Floodflow alteration	112	33	18	9	8	68
Fish and shellfish habitat	84	16	15	0	0	32
Sediment/toxicant/pathogen retention	145	45	11	20	5	88
Nutrient removal/retention/transformation	145	45	11	20	5	87
Production export	206	38	23	11	10	86
Sediment/shoreline stabilization	203	8	2	0	5	19
Wildlife habitat	144	39	52	13	12	118
Recreation	52	4	10	0	0	14
Educational/scientific value	10	0	5	0	0	5
Uniqueness/heritage	9	0	0	0	0	0
Visual quality/aesthetics	77	33	25	6	0	64
Endangered species habitat	96	27	15	4	22	68

1 Includes all wetlands within 100 feet of the right-of-way
2 Wetlands that perform each function as a principal function
3 Includes wetlands that would receive stormwater discharge that are more than 100 feet from the right-of-way

Whittenton Alternative

As shown in Table 4.16-42, the majority of wetlands along either the active or inactive segments of the Whittenton alternative proposed commuter rail line would experience negligible to minor impacts to functions and values. In most cases, the wetlands are relatively large in comparison to the area in which functions would be lost or altered, and there would be little overall effect on the ability of the wetland to provide these functions. As shown in the table, the functions most affected would be wildlife habitat, with 113 of the 145 wetlands providing this function affected. Most of these (80 percent) would experience negligible or minor impacts. Although wetlands along both the active and inactive segments would experience a decrease in their ability to support wildlife habitat functions, including rare species habitat, these changes would be greater in the inactive segments due to the barrier effect of the reconstructed tracks. The segment through the Hockomock Swamp would result in a minor effect on wildlife habitat through creation of a canopy gap although there would be no barrier to wildlife movement.

Table 4.16-42 Secondary and/or Indirect Effects on Wetlands within 100 feet of the Rail Segments along the Whittenton Alternative[1]

Function	Total Wetlands[2]	Negligible/Minor Impacts		Moderate/High Impacts		Total Impacts
		Active	Out of Service	Active	Out of Service	
Groundwater recharge/discharge	333	-	3	-	1	14
Floodflow alteration	122	33	17	9	8	72
Fish and shellfish habitat	78	16	11	-	-	35
Sediment/toxicant/pathogen retention	151	45	8	20	2	88
Nutrient removal/retention/transformation	152	45	8	20	2	87
Production export	203	38	14	11	7	86
Sediment/shoreline stabilization	204	8	-	-	5	19
Wildlife habitat	145	40	50	13	10	127
Recreation	49	4	7	-	-	14
Educational/scientific value	10	-	5	-	-	5
Uniqueness/heritage	8	-	-	-	-	-
Visual quality/aesthetics	73	33	22	6	-	67
Endangered species habitat	102	27	12	4	22	69

1 Includes all wetlands within 100 feet of the right-of-way.
2 Wetlands that perform each function as a principal function.

As a result of the overhead catenary structures required to provide electric rail service, the overhead catenary system would affect 52 wetlands that provide visual or aesthetic value, a majority of which provide this function.

Along the Whittenton Branch, overall indirect or secondary impacts are generally small, due to the proportionately small direct impacts along the route. A large portion of one wetland, Wetland TWB-08.1, would be eliminated to construct the railroad. As described above, this is a disturbed, mainly unvegetated wetland that has developed within the right-of-way due to compression of soils from ATV and other use of the path, and provides little function or value. The remaining impacts to wetlands along

the Whittenton Branch are negligible or minor. The most affected wetland function is wildlife habitat, as barrier and noise effects along the currently inactive right-of-way could impact existing habitat or reduce the effective contiguous habitat size of wetlands. This effect is most likely to be seen in the approximately 0.3 mile section of the Whittenton Branch where the right-of-way branches off from the stone quarry access road. In this section, in the vicinity of Wetlands TWB 03.1 through TWB 01, both the western and eastern sides of the tracks have large areas of undeveloped land with only a narrow, mostly-vegetated path between them, whose size may be effectively reduced by constructing the railroad.

4.16.9.4 Temporary Construction-Period Impacts

Construction impacts associated with a transportation project are those impacts that are temporary or short term, and occur only during construction. This section provides an overview of construction impacts, and outlines mitigation measures that would be employed to reduce short term impacts related to construction.

Temporary Impacts

Temporary impacts that may occur along the right-of-way include work areas adjacent to the alignment, the placement of erosion control devices including hay bales and silt fence, and any indirect impact that could result from the migration of exposed soils. Erosion and sedimentation control plans would be required from the contractor prior to commencement of work that would include ground disturbance. The Stormwater Pollution Prevention Plan (SWPPP) required under the General Permit for Discharges From Construction Activities[35], effective February 16, 2012 and promulgated by the US Environmental Protection Agency must identify potential source areas and describe what measures would be employed as erosion control, sedimentation control, temporary stormwater management, dust control, and winter stabilization measures. Multiple Best Management Practices (BMPs) would be used in sensitive areas. Erosion control plans would also address any in-water work at stream crossing locations.

Because railroad equipment operates optimally on relatively level track segments, existing and proposed rail corridors are located in areas of flat topography commonly associated with wetland resource areas. Wetlands frequently occur at the toe of the embankment along the existing rail corridors within the project area. Any work that disturbs the toe of slope along the right-of-way typically involves some amount of temporary wetland impacts for slope stabilization, the placement of erosion controls and to provide a work zone for laborers and equipment. To calculate these impacts, an 8-foot temporary work zone strip was assumed to occur on either side of the existing or proposed right-of-way. This area would be returned to preconstruction conditions following the completion of work. Temporary impacts to wetlands would be mitigated for by returning the area to original grade following work and by seeding it with an appropriate seed mix for the area.

An erosion and sedimentation control program would be implemented to limit temporary impacts associated with migrating sediment during the construction phase of the project. These programs typically minimize exposed soil through sequencing and temporary stabilization, placing structures to minimize stormwater runoff and erosion, and establishing a vegetated cover or other forms of stabilization as soon as practicable.

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[35] US Environmental Protection Agency. 2012. National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. US EPA, April 16, 2013, <http://www.epa.gov/npdes/pubs/cgp2012_finalpermit.pdf> (April 25, 2013)

Bridges and Culverts

For bridges over waterways, the contractor would ensure that all construction is performed within the temporary and permanent impact limits set forth by the environmental permits. Any dewatering, if required, would also be performed in accordance with the environmental conditions and would be discharged to an adjacent upland area using appropriate BMPs such as filter bags, settling pools and sediment traps. No debris shall be allowed to enter the watercourse. For longer spans over watercourses, such as the Taunton River, it may be necessary for the work to be done using barges.

Culverts along the right-of-way were evaluated for their stability and effectiveness at conveying water across the existing rail bed. Where possible, culverts would be replaced to meet the new stream crossing standards. Other culvert crossings would be improved to the maximum extent practicable to more closely adhere to stream crossings standards. Where expansions and improvements are not possible, culverts would be replaced in-kind, or would be left in place. The design of each culvert would be evaluated during the final design process to assess and prevent potential adverse effects on hydrology, streamflow, and fisheries.

Where culvert and bridge work is proposed, coffer dams or other silt barriers would be used to prevent debris and sediment from entering the work area and migrating downstream. Where necessary, water would be pumped around the culvert or the bridge structure during work to limit downstream disturbance. Following completion of work, areas adjacent to bridge abutments and culvert headwalls would be restored to its original condition through planting and grading.

Temporary impacts at bridges and culverts would occur on either end of the structure as a result of the temporary work zone that would be required in order for equipment and personnel to install the structure. Additional temporary impacts would occur through the installation of coffer dams, erosion control barriers, equipment movement and other construction period activities.

4.16.9.5 Summary of Direct Impacts by Alternative

This section and Table 4.16-43 summarizes the total potential impact to wetlands that would occur under each of the alternatives inclusive of stations and layover facilities.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would not impact wetlands.

Stoughton Electric Alternative

In terms of Commonwealth of Massachusetts resources, the Stoughton Electric Alternative would permanently impact 16,813 linear feet of Bank, 9.6 acres of BVW, 6.7 acres of BLSF, and 7.9 acres of new development Riverfront Area (Table 4.16-43). The largest impacts would occur in Raynham (1.3 acres of BVW) and Stoughton (2.0 acres of BVW), particularly south of the former Greyhound Park where the corridor forms the border of the Hockomock Swamp and then crosses through Pine Swamp. These impacts would occur in and along the edge of the abandoned railroad embankment. Minor impacts would occur along the components of the Southern Triangle, along the remainder of the Stoughton Line north of the Hockomock Swamp, at the Canton, East Taunton, Easton Village, and Raynham Park stations, and at traction power stations Stoughton TPSS-2 in New Bedford, Stoughton PS-1 in Easton, and Stoughton SWS-1 in Canton. Impacts would be closely evaluated during final design and would be minimized or avoided to the maximum extent practicable. Potential permanent wetland impacts along the Stoughton Line include 0.2 acre within the Hockomock Swamp ACEC. Indirect impacts within the

Hockomock swamp would be minimal due to the existing rail bed and the proposed elevated trestle that would span 1.8 miles of the Hockomock swamp. The elevated trestle would facilitate free wildlife passage across the proposed route, as well as maintain the current hydrology of the area. Additionally, approximately 1.5 acres of ORWs would be impacted along the Stoughton Electric Alternative.

Federally regulated waters of the United State include tributaries to navigable waters of the United States and their adjacent wetlands. For purposes of this FEIS, waters of the United States are divided into waterbodies/waterways and vegetated wetlands. The Stoughton Electric Alternative would result in the permanent loss of 12.3 acres of waters of the United States, including 1.9 acres of waterbodies/waterways and 10.4 acres of federally regulated wetlands.

Table 4.16-43 Permanent Wetland Resource Impacts by Alternative[1]

Alternative	Total
Stoughton Electric Alternative	
a. Massachusetts WPA Resources:	
Bank (lf)	16,813
Land Under Water (ac)	1.9
Bordering Vegetated Wetland (ac)	9.6
Wetlands (BVW) within ACECs (ac)	0.2
Outstanding Resource Waters (ac)	1.5
Bordering Land Subject to Flooding (ac)	6.7
Riverfront Area (ac)[2]	7.9
b. Waters of the United States:	
Waterbodies/Waterways (ac)	1.9
Vegetated Wetlands (ac)	10.4
Whittenton Electric Alternative	
a. Massachusetts WPA Resources:	
Bank (lf)	16,581
Land Under Water (ac)	1.8
Bordering Vegetated Wetland (ac)	8.4
Wetlands (BVW) within ACECs (ac)	0.2
Outstanding Resource Waters (ac)	1.1
Bordering Land Subject to Flooding (ac)	5.0
Riverfront Area (ac)[2]	7.8
b. Waters of the United States:	
Waterbodies/Waterways (ac)	1.8
Vegetated Wetlands (ac)	9.4

1 Figures are inclusive of stations and layovers.
2 New Development of Riverfront Area – the loss of on naturally vegetated lands within RA, excluding railroad track and ballast

Stoughton Diesel Alternative

Impacts to wetlands for the Stoughton Diesel Alternative are similar to the impacts identified above for the Stoughton Electric Alternative. The diesel alternative does not require traction power substations and would result in approximately 0.01 acre of permanent wetland impacts less than the Stoughton

Electric Alternative along the New Bedford Main Line. All other impacts are the same as those estimated for the remainder of Stoughton Electric Alternative.

Whittenton Electric Alternative

The Whittenton Electric Alternative would permanently impact the following resources regulated by the Commonwealth: 16,581 linear feet of Bank, 8.4 acres of BVW, 5.0 acres of BLSF, and 7.8 acres of new development Riverfront Area (Table 4.16-43). By town, the largest amount of impacts would occur in Berkley (1.4 acres of BVW) and Stoughton (2.0 acres).This alternative would leave the Stoughton Line corridor at Raynham Junction and instead would follow the Whittenton Branch to the Attleboro Secondary. This diversion would avoid wetland impacts in Pine Swamp. As with the Stoughton Alternative, the majority of impacts would occur in and along the edge of the abandoned railroad embankments. Minor impacts would occur along the components of the Southern Triangle, along the remainder of the Stoughton Line north of the Hockomock Swamp, at the Canton, East Taunton, Easton Village, and Raynham Park stations, and at traction power stations Whittenton TPSS-2 in New Bedford, Whittenton PS-1 in Easton, and Whittenton SWS-1 in Canton. Impacts would be avoided or minimized during final design to the maximum extent practicable.

Potential permanent wetland impacts along the Stoughton Line segment of this alternative include 0.2 acre within the Hockomock Swamp ACEC. Indirect impacts within the Hockomock swamp would be minimal due to the existing rail bed and the proposed elevated trestle that would span 1.8 miles of the Hockomock swamp. The elevated trestle would facilitate free wildlife passage across the proposed route, as well as maintain the current hydrology of the area. Additionally, approximately 1.1 acres of ORWs would be impacted along the Whittenton Electric Alternative.

The Whittenton Electric Alternative would result in the permanent loss of 11.2 acres of waters of the United States, including 1.8 acres of waterbodies/waterways and 9.4 acres of federally regulated wetlands.

Whittenton Diesel Alternative

Impacts to wetlands for the Whittenton Diesel Alternative are similar to the impacts identified above for the Whittenton Electric Alternative. The diesel alternative does not require traction power substations and would result in approximately 0.01 acre of permanent wetland impacts less than the Whittenton Electric Alternative along the New Bedford Main Line. All other impacts are the same as those estimated for the remainder of Whittenton Electric Alternative.

4.16.10 Mitigation

This section provides a description of wetland mitigation measures (wetland creation and restoration, and land preservation) proposed to minimize impacts and restore wetland resource areas functions and values. This section addresses both the Stoughton and Whittenton Alternatives. The two alternatives are identical except for a 5.8 mile stretch of tracks between Raynham Junction and Weir Junction in Raynham and Taunton, resulting in slightly lower wetland impacts along the Whittenton Alternative. Mitigation goals are considered based on the impacts for each alternative individually.

The Secretary’s Certificate focused on wetland creation, restoration, and land acquisition as mitigation for wetland and biodiversity impacts. Specific requirements of the Certificate included:

- The FEIR should identify targeted lands for acquisition by MassDOT as mitigation for the cumulative and indirect impacts of the project.

- A variance from the Wetlands Protection Act (WPA) regulations is required for the project's impacts to rare species. One concrete way for MassDOT to translate its smart growth planning into resource protection is to fund for conservation-protected targeted acquisition of parcels in Priority Protection Areas (PPAs) that are important to meet the long-term net benefit to rare species and preserve land with a high Index of Ecological Integrity. The FEIR should identify targeted sites for acquisition and describe in detail how the proposed land acquisition will offset direct and indirect impacts of the project.

- MassDOT should consult with EEA agencies to identify and protect areas critical to preserving the integrity of existing and valuable ecosystems. MassDOT should also partner with local Conservation Commissions and Planning Boards, regional planning agencies, and non-profit land trust/conservation organizations in a coordinated effort to adopt land preservation strategies that will stem wetland habitat fragmentation. The FEIR should clearly identify MassDOT's commitments to acquire land that meets the project's mitigation requirements and longer-term smart growth plans.

- The FEIR mitigation plan should include the following:

  - A 2:1 ratio for Bordering Vegetated Wetland (BVW) mitigation (at a minimum), at least 1:1 for all other wetlands. Where the USACE requires higher ratios (e.g., for forested wetlands) the mitigation plan should reflect the federal requirements also;

  - An evaluation of potential for restoration/preservation of Atlantic white cedar (*Chamaecyparis thyoides*) wetlands;

  - Meaningful Riverfront Area improvements and/or restoration to mitigate for riverfront impacts;

  - On-site elevation-specific compensatory storage for lost flood storage, or if such compensatory storage cannot be provided, demonstrate an insignificant increase in flooding, demonstrate that any incremental increase in flooding could be contained on the Proponent's property, or acquire flood easements;

  - Wetland restoration within the Hockomock Area of Critical Environmental Concern (ACEC).

- The FEIR should document with a high level of assurance that land identified for preservation, restriction or relocation/restoration to be taken by eminent domain can actually be acquired and will satisfy mitigation goals. As part of the assurances, additional mitigation areas should be identified as fall-back options in the event the primary mitigation goals are not achieved.

- MassDOT should consult with the Interagency Coordinating Group (ICG) for input on a draft mitigation plan including the methodology to identify appropriate mitigation for fragmentation impacts and the analysis of mitigation opportunities in the context of fulfilling

mitigation objectives. MassDOT should expand its outreach efforts during FEIR preparation to obtain public input on draft mitigation plans.

- The draft mitigation plan presented in the FEIR should clearly identify the impacts to be mitigated, for example specific resources, functions and values, amounts and types of impacts, etc. The plan should describe specific mitigation objectives and include an evaluation of mitigation options to determine which sites and mitigation measures perform best overall in terms of fulfilling mitigation objectives.

4.16.10.1 Avoidance and Minimization

State and Federal Guidelines

MassDEP has published a guidance document for wetland mitigation that discusses avoidance and minimization. The MassDEP guidance document avoids relying solely on replication for loss of wetlands, in light of evidence to suggest that poorly designed or constructed replication projects can fail to become new wetland areas as they were designed to do. The guidance document establishes avoidance as the first consideration for a project, using "evaluation of reasonable project designs that attempt to locate projects away from wetlands in order to avoid impacts." After considering all reasonable avoidance, minimization measures can be taken such as "steepening slopes, and, depending on the scale/nature of the project, construction of retaining walls or bridge spans to reduce wetland impacts." Only after avoidance and minimization have been applied to the fullest extent practicable should replication be considered for mitigation purposes. The use of avoidance and demonstrating no reasonable alternatives that would allow the project to proceed in compliance with the regulations one of the criteria required to obtain a Variance from the regulations.

Federal guidelines about avoidance and minimization are presented in the Section 404(b)(1) "Guidelines for Specification of Disposal Sites for Dredged or Fill Material." A Memorandum of Agreement (MOA) between the USACE and USEPA sets forth a sequence approach for evaluating wetland impacts that calls first for avoidance, then minimization, and finally compensatory mitigation for impacts. The goal of the guidelines and MOA is to establish no net loss of wetland functions and values.

Avoidance

Avoidance of wetland impacts was considered when designing the track layout for the alternatives described below. When possible, the track was kept within the existing footprint, elevated by trestle, and/or re-routed away from large areas of wetland impact. Retaining walls were also included, to the maximum extent practicable in this design stage, in track and layout design to avoid additional impacts associated with large grading footprints. Complete avoidance of all wetland impacts would only be possible through the No Build Alternative, which does not meet the project purpose. The sections below describe specific steps taken towards avoidance.

The Stoughton Electric Alternative would provide commuter rail service to South Station using the Northeast Corridor, the Stoughton Line, the New Bedford Main Line, and the Fall River Secondary. This alternative requires reconstructing track on the Southern Triangle segments and reconstructing freight rail and existing inactive rail along the Stoughton Line in Stoughton, Easton, Raynham, and Taunton, as well as the Southern Triangle. The routes were selected to avoid wetland impacts associated with the design and construction of a new right-of-way. Impacts are unavoidable along this alternative because wetlands are directly adjacent to existing track and, in some locations, on the rail bed itself.

Several portions of the Stoughton Alternative would use retaining walls to avoid wetland impacts. Impacts to 28 wetlands would be minimized by retaining walls along the Stoughton Alternative, particularly at wetlands ST 7A in Stoughton. In addition to the proposed retaining walls, a proposed trestle through the Hockomock Swamp would reduce direct wetland impacts. The proposed track design includes approximately 8,500 feet of elevated trestle along the track segment that crosses the Hockomock Swamp through Raynham and Easton. Along this portion of the right-of-way, the track would be supported by pilings. The elevated track design would avoid indirect impacts such as hydrologic movement, animal crossings, and wetland connectivity. The reconstruction of the existing right-of-way would occur within the existing footprint to the maximum extent practicable to further avoid wetland impacts.

Both portions of the Southern Triangle would use retaining walls to avoid wetland impacts. The Fall River Secondary and New Bedford Main Line would use retaining walls in ten locations to avoid additional impacts in eleven wetlands.

Station and layover facilities were chosen from a large pool of potential sites and were selected to avoid wetland impacts to the extent practicable. Neither of the proposed layover sites would affect vegetated wetlands. Proposed stations at North Easton, Easton Village, Raynham Park, Taunton, Fall River Depot, Battleship Cove, and Whale's Tooth would avoid wetlands.

The Whittenton Alternative is different from the Stoughton Alternative only along a portion of right-of-way between Raynham Junction and Weir Junction, a length of approximately 5.8 miles. The Whittenton and Stoughton Alternatives run the same course on the Stoughton Line from Canton to Raynham Junction. The New Bedford Main Line and the Fall River Secondary are also identical for both alternatives. The Whittenton Alternative, using the Whittenton Branch and a portion of the Attleboro Secondary, avoids some wetland areas associated with Pine Swamp that would be impacted by the Stoughton Alternative. Structural avoidance measures such as retaining walls would be used in the same manner as on the Stoughton Alternative, and the trestle through the Hockomock Swamp would also remain part of the design.

Minimization

The conceptual alternatives evaluated in this report include design features that were selected to minimize wetland impacts, such as the use of single track segments where possible to minimize widening of the right-of-way and locating railroad passing sidings in adjacent uplands rather than in wetlands. Wetland impacts would be further evaluated during final design. As part of that process, additional steps would be taken to minimize specific impacts along the preferred alternative, such as tightening side slopes and using retaining walls to reduce the overall footprint associated with the proposed work.

Proposed track design and layout in conjunction with construction practices would minimize impacts to wetlands to the extent practicable. In the final design process, impacts would be further minimized by design modifications including the use of steep slopes and retaining walls when the right-of-way is elevated above wetland resource areas. For example, use of a vertical retaining wall could reduce wetland impacts by 50 percent or more over a sloped embankment. Minimization of impacts to wetland resource areas has occurred since the DEIS/DEIR, which estimated a total of 11.9 acres of wetland impact BVW and LUW along the right-of-way for the Stoughton Alternative. The current estimate of the impacts to these resource areas from the Stoughton Alternative is 11.7 acres and 10.6 acres from the

Whittenton Alternative. Additional measures to minimize wetland impacts will be considered as the project design advances.

Wetland impacts at station locations were minimized by designing station layouts around wetland resources and by selecting station locations where the smallest number of impacts would occur. Within the footprint of the selected sites, the configuration of station amenities and storage tracks were modified to minimize impacts that could not otherwise be avoided.

4.16.10.2 Mitigation Goals and Objectives

Introduction

This section identifies the goals of wetland mitigation, based on regulatory requirements and wetland impacts previously presented. The objective of the mitigation design is to replace the functions and values provided by wetlands that would be altered during reconstruction or construction of the preferred alternative. The design of wetland replacement areas will incorporate, to the extent possible, functions and values that have been lost through wetland impacts. Wetlands would be designed to conform to the guidelines developed by the USACE and would meet the performance standards contained in the WPA regulations to the extent practicable. This would include providing minimums of 2:1 replacement for BVW, and 3:1 replacement for lost federally regulated forested wetlands. Bank and BLSF would be replaced at a 1:1 ratio and would be replaced in kind to the extent practicable. Compensatory mitigation areas would also be designed to provide vernal pool habitat.

Replacement of impacted wetlands, along with their functions and values would be achieved through several approaches including: restoring former wetland areas that were filled or otherwise altered and are currently upland; restoring functions to an existing, degraded wetland; enhancing wetland functions; and contributions to a mitigation bank or in lieu fee program, if one were available in the same watershed.

A watershed approach to wetland mitigation has been taken to compensate for direct impacts associated with the proposed work. Permanent impacts associated with each alternative were identified by watershed and by cover type. Proposed mitigation would seek to mitigate for impacted wetland cover types within the each watershed where impact would occur. USACE guidelines for mitigation ratios were followed in conjunction with guidelines established by MassDEP. Establishment of wetlands under USACE guidelines also mitigate for secondary impacts of the project. The tables in the remainder of this section show mitigation goals required under both state and federal guidelines.

The following sections present the wetland mitigation goals under both state and federal guidelines for both the Stoughton and Whittenton Alternatives. The following information is based on the current level of design for the project. At later design stages, detailed wildlife habitat assessments would be conducted of both impact areas and proposed mitigation areas. Mitigation goals, plans, and design may be adjusted based on the results of these assessments.

Massachusetts Wetlands Protection Act

On similar projects, MassDEP has required a 2:1 replacement ratio for BVW as part of a WPA variance. MassDEP typically seeks strict replication by requiring mitigation sites to be on site or adjacent to the impacted site, in the same watershed, with the same elevation, habitat type, hydrological connection, ecological functions, and other key characteristics. BLSF requires mitigation at a 1:1 ratio to provide compensatory flood storage. This would be designed during the final design phase and would follow the

performance standards for BLSF replacement to the extent practicable. Impacts to LUW (shown as having a cover type of OW) do not have an associated replacement ratio under the WPA. MassDEP has indicated that 1:1 replacement of LUW areas would constitute sufficient mitigation for this resource area.

Stoughton Electric Alternative

The Stoughton Alternative would result in the alteration of approximately 16,813 linear feet of Bank, of which the majority are intermittent or perennial streams that flow on the railroad bed due to blocked drainage ditches. Most of these streams lack vegetation, and do not provide important wildlife habitat. Impacts will be mitigated at a 1:1 ratio, on-site, by restoration of drainage ditches. One drainage diversion in Raynham has been determined to be a perennial stream with vegetated banks.

The project would result in the loss of 9.6 acres of BVW, which would require a 2:1 mitigation ratio, for a total replacement of 19.2 acres. Areas of temporary alteration (5.4 acres) would be restored in place. The project would also result in the loss of 1.9 acres of LUW, of which the majority is associated with the Raynham perennial stream. An additional 0.3 acre of LUW is within Terry Brook Pond in Freetown.

A total of 6.7 acres of BLSF would be impacted by the Stoughton Electric Alternative. Mitigation would be provided for the loss of compensatory flood storage (to be determined during subsequent final design phases of the project) and for the loss of wildlife habitat, at a 1:1 ratio. The project would result in the loss of 7.9 acres of vegetation within Riverfront Area. Further analysis is required to determine if any of the 22 affected areas provide important wildlife habitat and would require compensatory mitigation. Table 4.16-44 presents the wetland mitigation goals for impacts to state resource areas for the Stoughton Electric Alternative.

Table 4.16-44 Wetland Mitigation Goals–State Resource Areas (Stoughton Electric Alternative)

Municipality	Bank (lf)	BVW (ac)	LUW (ac)	BLSF1 (ac)	RA2 (ac)
Canton	90	<0.1	-	0.9	0.4
Stoughton	539	2.0	-	0.7	-
Easton	5,423	0.3	-	0.8	0.8
Raynham	6,994	1.3	1.5	2.9	2.5
Taunton	468	1.5	-	0.8	1.3
Berkley	233	1.4	-	0.2	1.1
Lakeville	606	0.8	-	0.1	0.8
Freetown	2,460	1.0	0.3	0.3	1.0
New Bedford	-	1.2		<0.1	-
Fall River	-	-		-	-
Total 1:1 Mitigation[3]	16,813	9. 6	1.9	6.7	7.9[4]
Total 2:1 Mitigation		19.2			

Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 BLSF and ILSF were withdrawn from the ANRAD applications for the municipalities of Stoughton and Easton, and therefore neither resource area was confirmed by the Conservation Commissions from either municipality. Information for these resource areas is presented here for informational purposes and is approximate.

2 New Development of Riverfront Area – the loss of naturally vegetated lands within RA, excluding railroad track and ballast.

3 Total 1:1 Mitigation figures also equal the total impact to wetland resource areas.

4 Requires replacement of important wildlife habitat, rather than acreage of equivalent land.

Whittenton Electric Alternative

The Whittenton Alternative would result in the alteration of approximately 16,581 linear feet of Bank, of which the majority are intermittent or perennial streams that flow on the railroad bed due to blocked drainage ditches. Most of these streams lack vegetation, and do not provide important wildlife habitat. Impacts will be mitigated at a 1:1 ratio, on-site, by restoration of drainage ditches. One drainage diversion in Raynham has been determined to be a perennial stream with vegetated banks.

The project would result in the loss of 8.4 acres of BVW, which would require a 2:1 mitigation ratio, for a total replacement of 16.8 acres. Areas of temporary alteration (4.7 acres) would be restored in place. The project would also result in the loss of 1.8 acres of LUW, of which the majority is associated with the Raynham perennial stream. An additional 0.3 acre of LUW is within Terry Brook Pond in Freetown.

A total of 5.0 acres of BLSF would be impacted by the Whittenton Alternative. Mitigation would be provided for the loss of compensatory flood storage (to be determined during subsequent final design phases of the project) and for the loss of wildlife habitat, at a 1:1 ratio. The project would result in the loss of 8.3 acres of vegetation within Riverfront Area. Further analysis is required to determine if any of the 22 affected areas provide important wildlife habitat and would require compensatory mitigation. Table 4.16-45 presents the wetland mitigation goals for impacts to state resource areas for the Whittenton Alternative.

Table 4.16-45 Wetland Mitigation Goals–State Resource Areas (Whittenton Alternative)

Municipality	Bank (lf)	BVW (ac)	LUW (ac)	BLSF1 (ac)	RA2 (ac)
Canton	90	<0.1	-	0.9	0.4
Stoughton	539	2.0	-	0.7	-
Easton	5,423	0.3	-	0.8	0.8
Raynham	6,773	0.5	1.5	1.2	2.3
Taunton	457	1.2	-	0.8	1.4
Berkley	233	1.4	-	0.2	1.1
Lakeville	606	0.8	-	0.1	0.8
Freetown	2,460	1.0	0.3	0.3	1.0
New Bedford	-	1.2		<0.1	-
Fall River	-	-		-	-
Total 1:1 Mitigation	16,581	8.4	1.8	5.0	7.8[4]
Total 2:1 Mitigation		16.8			

Wetland Classifications: BVW = Bordering Vegetated Wetland, LUW=Land Under Water, BLSF = Bordering Land Subject to Flooding, ILSF = Isolated Land Subject to Flooding, RA = Riverfront Area.

1 BLSF and ILSF were withdrawn from the ANRAD applications for the municipalities of Stoughton and Easton, and therefore neither resource area was confirmed by the Conservation Commissions from either municipality. Information for these resource areas is presented here for informational purposes and is approximate.

2 New Development of Riverfront Area – the loss of naturally vegetated lands within RA, excluding railroad track and ballast.

3 Total 1:1 Mitigation figures also equal the total impact to wetland resource areas.

4 Requires replacement of important wildlife habitat, rather than acreage of equivalent land.

Federal Wetlands

The following sections present the wetland mitigation goals under federal guidelines for both permanent and temporary impacts for both the Stoughton and Whittenton Alternatives.

Stoughton Electric Alternative

The following sections present the wetland mitigation goals under federal guidelines for both permanent and temporary impacts, and presents mitigation goals by watershed, for the Stoughton Electric Alternative.

Permanent Impacts—The Stoughton Alternative would result in the loss of 10.4 acres of vegetated jurisdictional wetlands in three primary cover types (palustrine emergent wetland, palustrine scrub-shrub swamp, and palustrine wooded swamp). The first two cover types require mitigation at a 2:1 ratio (assuming restoration), while wooded swamp requires a higher mitigation ratio of 3:1 (assuming restoration). The total minimum area required for mitigation (as restoration) of these vegetated wetlands would be 31.3 acres. The project would also result in the loss of 1.9 acres of Open Water, which would be mitigated at a 1:1 ratio. The majority (1.5 acres) of Open Water is associated with the Raynham perennial stream. An additional 0.3 acre is within Terry Brook Pond in Freetown. Table 4.16-46 establishes goals for mitigation of impacts to federal jurisdictional wetlands for the Stoughton Electric Alternative, based on the ratios contained in the USACE New England District mitigation guidance.

Table 4.16-46 Summary of Federal Mitigation Goals by Cover Type–Permanent Impacts (acres) (Stoughton Electric Alternative)

Municipality	Total Impact	OW	PEM–Shallow Marsh	PEM–Deep Marsh	PSS–Scrub-Shrub	PFO–WSD	PFO–WSM
Canton	<0.1	-	-	-	-	<0.1	-
Stoughton	2.1	-	<0.1	-	-	2.0	-
Easton	0.4	-	-	<0.1	0.3	0.1	-
Raynham	2.9	1.5	-	<0.1	<0.1	1.3	<0.1
Taunton	1.9	-	0.6	-	-	1.3	-
Berkley	1.5	-	-	-	0.2	1.1	0.1
Lakeville	0.8	-	-	-	0.1	0.7	-
Freetown	1.4	0.3	<0.1	-	0.2	0.9	-
New Bedford	1.2		0.4	-	<0.1	0.8	<0.1
Fall River	<0.1		-	-	-	<0.1	-
Total Impact	12.3	1.9	1.0	<0.1	0.9	8.3	0.2
Minimum Mitigation Ratio[1]		1:1	2:1	2:1	2:1	3:1	3:1
Total Mitigation	31.3	1.9	Total PEM: 2.1		1.8	Total PFO: 25.5	

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
PFO Subgroups: WSD = Wooded Swamp Deciduous, WSM = Wooded Swamp Mixed trees.
1 Assumes Restoration as the mitigation method.

Temporary Impacts—As shown in Table 4.16-47, the Stoughton Alternative would result in the temporary alteration of 5.6 acres of vegetated jurisdictional wetlands in three primary cover types (palustrine emergent wetland, palustrine scrub-shrub swamp, and palustrine wooded swamp). The first two cover types require mitigation at a 1:1 ratio (restoration in situ), while wooded swamp requires a higher mitigation ratio of 1.5:1 (restoration in situ plus additional mitigation to compensate for longer-term changes in vegetative cover type and wildlife habitat functions). Temporary impacts would also occur to 0.3 acre of Open Water. Since the majority of the Open Water area is composed of unvegetated banks of intermittent streams along the right-of-way and areas where culverts are being replaced or upgraded, mitigation is not proposed for these areas. The total area required for mitigation (as restoration) would be 8.1 acres. About 5.7 acres of this mitigation can be accomplished by restoration in situ; the remaining 2.4 acres of mitigation will be added to the mitigation goals for permanent impacts.

Table 4.16-47 Summary of Federal Mitigation by Cover Type–Temporary Impacts (acres) (Stoughton Electric Alternative)

Municipality	Total Impact	OW	PEM– Shallow Marsh	PEM– Deep Marsh	PSS– Scrub-Shrub	PFO– WSD	PFO– WSM
Canton	0.1	<0.1	<0.1	-	<0.1	<0.1	-
Stoughton	0.1	-	<0.1	-	-	0.1	-
Easton	0.2	-	-	<0.1	<0.1	0.1	-
Raynham	1.0	0.1	-	<0.1	0.1	0.8	<0.1
Taunton	1.4	<0.1	0.2	-	-	1.2	-
Berkley	1.0	-	-	-	0.1	0.8	<0.1
Lakeville	0.6	<0.1	-	-	<0.1	0.5	-
Freetown	0.7	0.1	0.1	-	<0.1	0.4	-
New Bedford	0.8		<0.1	-	0.1	0.6	0.1
Fall River	0.1		-	-	-	0.1	-
Total Impact	5.9	0.3	0.3	0.1	0.4	4.7	0.1
Minimum Mitigation Ratio[1]			1:1	1:1	1:1	1.5	1.5
Total Mitigation	8.1[2]	0.0	Total PEM: 0.4		0.4	Total PFO: 7.3	

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
PFO Subgroups: WSD = Wooded Swamp Deciduous, WSM = Wooded Swamp Mixed trees.
1 Assumes all temporary impacts restored in place. Forested wetland (PFO) requires a higher ratio due to temporal change in wildlife habitat function.
2 Includes 5.6 acres of restoration in situ and 2.4 acres to be added to the mitigation goals for permanent impacts.

Mitigation Goals by Watershed—Compensatory mitigation for the loss of vegetated wetlands would be conceived with the overall goal to distribute mitigation among the four watersheds comprising the project area, as shown in Table 4.16-48. Under this general scenario, small areas of mitigation would be in the Neponset River Watershed and the Narragansett Bay watershed. The majority of the mitigation (88 percent) would be in the Taunton River Watershed, while approximately 12 percent would be allocated to the Buzzards Bay watershed. The mitigation goals shown in Table 4.16-48 include the mitigation goals for permanent impacts to vegetated wetlands and waterways (31.3 acres based on a permanent impact of 12.3 acres) as well as those temporary impacts not restored in situ (2.4 acres total). About 2.1 acres of restoration for temporary impacts would be in the Taunton River watershed and 0.3 acre would be in the Buzzards Bay watershed.

Table 4.16-48 Mitigation Goals by Watershed (Federal Wetlands/Waterways) for Stoughton Electric Alternative

Watershed	Impact Amount	Percentage
Neponset River	<0.1 ac	<1%
Taunton River	11.0 ac	88%
Buzzards Bay	1.2 ac	11%
Narragansett/Mt. Hope Bay	<0.1 ac	<1%
Totals	12.3 ac	33.7 ac

Whittenton Electric Alternative

The following sections present the wetland mitigation goals under federal guidelines for both permanent and temporary impacts, and presents mitigation goals by watershed, for the Whittenton Alternative.

Permanent Impacts—The Whittenton Alternative would result in the loss of 9.4 acres of vegetated jurisdictional wetlands in three primary cover types (palustrine emergent wetland, palustrine scrub-shrub swamp, and palustrine wooded swamp). The first two cover types require mitigation at a 2:1 ratio (assuming restoration), while wooded swamp requires a higher mitigation ratio of 3:1 (assuming restoration). The total minimum area required for mitigation (as restoration) of these vegetated wetlands would be 26.6 acres. The project would also result in the loss of 1.8 acres of Open Water, which would be mitigated at a 1:1 ratio. The majority (1.5 acres) of Open Water is associated with the Raynham perennial stream. An additional 0.3 acre is within Terry Brook Pond in Freetown. Table 4.16-49 establishes goals for mitigation of impacts to federal jurisdictional wetlands for the Whittenton Alternative, based on the ratios contained in the USACE's New England District mitigation guidance.

Table 4.16-49 Summary of Federal Mitigation Goals by Cover Type–Permanent Impacts (acres) (Whittenton Alternative)

Municipality	Total Impact	OW	PEM–Shallow Marsh	PEM–Deep Marsh	PSS–Scrub-Shrub	PFO–WSD	PFO–WSM
Canton	<0.1	-	-	-	-	<0.1	-
Stoughton	2.1	-	<0.1	-	-	2.0	-
Easton	0.4	-	-	<0.1	0.3	0.1	-
Raynham	2.1	1.5	-	-	<0.1	0.5	-
Taunton	1.6	-	0.1	-	-	1.5	-
Berkley	1.5	-	-	-	0.2	1.1	0.1
Lakeville	0.8	-	-	-	0.1	0.7	-
Freetown	1.4	0.3	<0.1	-	0.2	0.9	-
New Bedford	1.2		0.4	-	<0.1	0.8	<0.1
Fall River	<0.1		-	-	-	<0.1	-
Total Impact	11.2	1.8	0.6	<0.1	0.9	7.7	0.2
Minimum Mitigation Ratio[1]		1:1	2:1	2:1	2:1	3:1	3:1
Total Mitigation	28.4	1.8	Total PEM: 1.2		1.8	Total PFO: 23.6	

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
PFO Subgroups: WSD = Wooded Swamp Deciduous, WSM = Wooded Swamp Mixed trees.
1 Assumes Restoration as the mitigation method.

Temporary Impacts—As shown in Table 4.16-50, the Whittenton Alternative would result in the temporary alteration of 4.9 acres of vegetated jurisdictional wetlands in three primary cover types (palustrine emergent wetland, palustrine scrub-shrub swamp, and palustrine wooded swamp). The first two cover types require mitigation at a 1:1 ratio (restoration in situ), while wooded swamp requires a higher mitigation ratio of 1.5:1 (restoration in situ plus additional mitigation to compensate for longer-term changes in vegetative cover type and wildlife habitat functions). Temporary impacts would also occur to 0.2 acre of Open Water. Since the majority of the Open Water area is comprised of unvegetated banks of intermittent streams along the right-of-way and areas where culverts are being replaced or upgraded, mitigation is not proposed for these areas. The total area required for mitigation

(as restoration) would be 7.0 acres. About 4.8 acres of this mitigation can be accomplished by restoration in situ; the remaining 2.2 acres of mitigation will be added to the mitigation goals for permanent impacts.

Table 4.16-50 Summary of Federal Mitigation by Cover Type–Temporary Impacts (acres) (Whittenton Alternative)

Municipality	Total Impact	OW	PEM– Shallow Marsh	PEM– Deep Marsh	PSS– Scrub-Shrub	PFO– WSD	PFO– WSM
Canton	0.1	<0.1	<0.1	-	<0.1	<0.1	-
Stoughton	0.1	-	<0.1	-	-	0.1	-
Easton	0.2	-	-	<0.1	<0.1	0.1	-
Raynham	0.4	<0.1	-	<0.1	0.1	0.4	-
Taunton	1.1	-	0.1	-	-	1.1	-
Berkley	1.0	-	-	-	0.1	0.8	<0.1
Lakeville	0.6	<0.1	-	-	<0.1	0.5	-
Freetown	0.7	0.1	0.1	-	<0.1	0.4	-
New Bedford	0.8		<0.1	-	0.1	0.6	0.1
Fall River	0.1		-	-	-	0.1	-
Total	5.1	0.2	0.3	<0.1	0.3	4.1	0.1
Minimum Mitigation Ratio[1]			1:1	1:1	1:1	1.5	1.5
Total Mitigation	7.0	0.0	Total PEM: 0.3		0.3	Total PFO: 6.4	

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub
PFO = Palustrine Forested.
PFO Subgroups: WSD = Wooded Swamp Deciduous, WSM = Wooded Swamp Mixed trees.

1 Assumes all temporary impacts restored in place. Forested wetland (PFO) requires a higher ratio due to temporal change in wildlife habitat function.

2 Includes 5.0 acres of restoration in situ and 2.2 acres to be added to the mitigation goals for permanent impacts.

Mitigation Goals by Watershed—Compensatory mitigation for the loss of vegetated wetlands would be distributed among the four watersheds comprising the project area, as shown in Table 4.16-51. A small amount of mitigation (<0.1 acre) would be in the Neponset River Watershed and (0.2 acre) in the Narragansett Bay watershed. The majority of the mitigation (86 percent) would be in the Taunton River Watershed, while approximately 12 percent would be allocated to the Buzzards Bay watershed. The mitigation goals shown in Table 4.16-51 include the mitigation goals for permanent impacts (11.2 acres total) as well as those temporary impacts not restored in situ (2.2 acres total), allocated by watershed. About 2.0 acres of restoration for temporary impact would be in the Taunton River watershed and 0.2 acre would be in the Buzzards Bay watershed.

Table 4.16-51 Mitigation Goals by Watershed (Federal Wetlands/Waterways) (Whittenton Alternative)

Watershed	Permanent Impacts	Mitigation
Neponset River	<0.1 ac	<1%
Taunton River	9.9 ac	86%
Buzzards Bay	1.7 ac	12%
Narragansett/Mt. Hope Bay	0.2 ac	1%
Totals	11.2 ac	31.0 ac

Functions and Values

Wetland mitigation goals seek not only to replace an area equal to or greater than the lost or directly impacted area of wetlands, but also to replace the lost functions and values of the wetland areas. These functions and values are described in a guidance document[36] published by the USACE's New England District describing functions and values of wetlands and their evaluation. Impacts to wetland functions and values along the Stoughton and Whittenton Alternatives were previously analyzed (see Tables 4.16-41 and 42). The review of functions and values of impacted areas was based on an analysis of individual wetlands along the right-of-way. During the subsequent design and permitting phase, detailed wildlife habitat assessments as required by DEP regulations, would be performed, and the functions and values assessments done using the Corps methodology would be refined based on more detailed site-specific methodologies in order to refine the information on functions and values provided by wetlands along the project corridor. The USACE's guidance document on mitigation states that for effective replacement of functions, "Applicants should expect that more than 1:1 acreage replacement will usually be deemed appropriate." Replacement ratios agreed upon by MassDOT and reviewing agencies are all 1:1 or greater. Future evaluation of areas used for wetland mitigation would include an assessment of the functions and values that would be provided by these areas.

Summary

Table 4.16-52 and Table 4.16-53 provide a summary of federal wetland mitigation goals for the project for the Stoughton and Whittenton Alternatives.

[36] USACE. 1999. The Highway Methodology Workbook Supplement, Wetland Functions and Values - a Descriptive Approach. New England District, U.S. Army Corps of Engineers, NAEEP-360-1-30a. Concord, MA.

Table 4.16-52 Vegetated Wetland/Waterway Mitigation Goals (Stoughton Electric Alternative)

Watershed	Cover Type	Permanent Impact (ac)	Temporary Impact (ac)	Federal Mitigation Goal (ac)1
Buzzards Bay Watershed	OW	0.1	<0.1	0.1
	PEM	0.4	<0.1	0.7
	PSS	<0.1	0.1	<0.1
	PFO	0.8	0.7	2.8
Subtotal		1.2	0.8	3.6
Narragansett/Mt. Hope Bay Watershed	PFO	<0.1	0.1	0.1
Subtotal		<0.1	0.1	0.1
Neponset River Watershed	OW	-	<0.1	-
	PEM	-	<0.1	-
	PSS	-	<0.1	-
	PFO	<0.1	<0.1	0.1
Subtotal		<0.1	<0.1	0.1
Taunton River Watershed	OW	1.9	0.3	1.9
	PEM	0.7	0.4	1.4
	PSS	0.9	0.3	1.8
	PFO	7.6	4.1	24.8
Subtotal		11.0	4.7	29.8
Total		12.3	5.9	33.6

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
Shading denotes temporary impact amounts that will be replaced in situ.
Assumes a 2:1 mitigation ratio for marsh and scrub-scrub cover types, a 3:1 mitigation ratio for forested cover types, and a 1:1 mitigation ratio for Open Water. Also assumes an additional 0.5:1 amount of temporary impact for PFO.

Table 4.16-53 Vegetated Wetland Mitigation Goals (Whittenton Electric Alternative)

Watershed	Cover Type	Permanent Impact (ac)	Temporary Impact (ac)	Federal Mitigation Goal (ac)[1]
Buzzards Bay Watershed	OW	0.1	<0.1	0.1
	PEM	0.4	<0.1	0.7
	PSS	<0.1	0.1	<0.1
	PFO	0.8	0.7	2.8
Subtotal		1.2	0.8	3.6
Mt. Hope Bay Watershed	PFO	<0.1	0.1	0.1
Subtotal		<0.1	0.1	0.1
Neponset River Watershed	OW	-	<0.1	-
	PEM	-	<0.1	-
	PSS	-	<0.1	-
	PFO	<0.1	<0.1	0.1
Subtotal		<0.1	<0.1	0.1
Taunton River Watershed	OW	1.8	0.2	1.8
	PEM	0.2	0.3	0.5
	PSS	0.9	0.3	1.7
	PFO	7.0	3.5	22.7
Subtotal		9.9	4.2	26.7
Total		11.2	5.1	30.6

Notes: Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
Shading denotes temporary impact amounts that will be replaced in situ.
Assumes a 2:1 mitigation ratio for marsh and scrub-scrub cover types, a 3:1 mitigation ratio for forested cover types, and a 1:1 mitigation ratio for Open Water. Also assumes an additional 0.5:1 amount of temporary impact for PFO.

4.16.10.3 Compensatory Mitigation Site Selection

This section describes the process undertaken by MassDOT to identify appropriate compensatory mitigation sites through a multi-level screening process. The process involved GIS analysis as well as coordination between MassDOT and regulatory agencies to review potential sites suitable for wetland establishment and preservation.

Agency Coordination and GIS Analysis

Preliminary lists were generated of potential sites to be used for wetland establishment and restoration, and potential sites to be used for land preservation. These lists were generated using sites first identified in the DEIS/DEIR, either as candidates for wetland establishment or as Priority Preservation Areas (PPAs). Most of these sites are currently undeveloped, privately owned land, although some PPAs are several hundred or more acres in size and encompass some public and private roads, buildings, and utility rights of way. A total of 25 potential wetland establishment sites and 38 PPAs were identified.

Each site was mapped using aerial photography, and GIS software was used to determine the size of each site. MassDEP wetland data layers were used to determine the cover types of adjacent or nearby wetlands. Elevation data was added to the images, as well as the extent of protected open space, priority habitat of rare species, and vernal pools within and/or adjacent to each site. This analysis was performed for each site in the list of potential wetland establishment sites as well as each site in the list of PPAs. The lists and the resulting sets of images were reviewed in meetings between MassDOT and regulatory agencies.

MassDOT met with resource agency representatives from the USACE, MassDEP, USEPA, and the Massachusetts Natural Heritage and Endangered Species Program (NHESP) to allow the reviewing agencies to have input on which sites have the highest potential value for wetland establishment and/or preservation. MassDOT reviewed each site with the agencies and noted comments. Factors deemed important by MassDOT and the reviewing agencies were:

- Proximity to the project corridor;
- Size of wetland areas adjacent to the site;
- Ability to provide compensatory flood storage; and
- Other known or potential environmental resources nearby, such as rare species habitat or protected open space.

Wetland Establishment and Restoration Sites

MassDOT and the reviewing agencies reviewed the preliminary list of potential wetland establishment sites to determine the sites with the highest potential for wetland establishment and/or restoration. Based on agency input, the preliminary list was divided into three groups:

- Tier 1 sites, which were advanced to a preliminary design stage, including preliminary grading and planting;
- Tier 2 sites, to be used in the event that not enough wetland establishment can be achieved from Tier 1 sites; and
- Sites dismissed from further consideration.

The review of the preliminary list of potential wetland establishment sites yielded 5 sites designated as Tier 1, 9 sites to be retained as Tier 2, and 11 sites that were dismissed from further consideration. Table 4.16-54 presents the preliminary list of sites reviewed by MassDOT and the reviewing agencies.

During review meetings, an additional site was added, an auto junkyard directly adjacent to Pine Swamp in Raynham, north of East Brittania Street. This site could provide a valuable wetland establishment and restoration opportunity, since at least a portion of the junkyard has been constructed on filled wetlands. In addition, the project proposes to fill approximately 0.3 acre of open water in Terry Brook Pond in Freetown. While Terry Brook Pond was not on the preliminary list of potential wetland establishment sites, MassDOT analyzed the immediate area surrounding Terry Brook Pond to identify any areas that could be used for establishment of open water areas.

Table 4.16-54 Potential Wetland Establishment Sites

Site ID	Location	Size (ac)	Adjacent Cover Type	Category	Rationale
East-01	Adjacent to cranberry bog and Little Cedar Swamp (north of Morse Rd.), Easton	1.3	Cranberry bogs	Dismiss	May have current utility as turtle nesting habitat
East-01a	Adjacent to cranberry bog and Little Cedar Swamp (north of Morse Rd.), Easton	1.0	Cranberry bogs	Dismiss	Already a wetland area, may not need restoration
East-02	Pit east of Prospect St. south of power line easement, Easton	3.1	PFO	Tier 2	
East-04	North of power line easement on Route 138, Easton	5.5	PFO	Tier 1	Upland area directly adjacent to wetland
East-05	Power line ROW between Route 138 and tracks	8.5	PFO	Dismiss	High likelihood of colonization by invasive species
Rayn-01	End of Old King Road, Raynham	3.2	PFO	Tier 2	Residential yard
Rayn-02	Access road west of Juniper Hill Drive, Raynham	8.3	PFO	Tier 2	Difficulty preventing use of area by off-road vehicles
Rayn-03	Route 138 across from dog track, Raynham	6.0	PFO, PSS	Tier 2	
Rayn-04 (Carney Yard)	Carney Yard, across ROW from dog track, Raynham	12.4	PFO	Tier 1	Both wetland and upland restoration opportunities
Rayn-05	East of ROW, between E. Brittania and Thrasher St., Raynham	2.8	PFO	Tier 2	
Taun-01	End of West Water Street, Taunton	3.2	OW	Tier 2	
Taun-02	Taunton River, Weir Junction, Taunton	7.8	OW	Dismiss	Difficulty creating emergent wetland shelves
Taun-02a	Taunton River, Weir Junction, Taunton	6.0	OW	Dismiss	Difficulty creating emergent wetland shelves
Other-01 (Middleborough Brickyard)	Corner of Middleborough, Halifax, Bridgewater	78.7	OW	Tier 2	
Other-02 (Burrage Pond WMA)	Burrage Pond between Elm Street and Route 27, Hanson and Halifax	74.4	PEM, PSS, PFO, Cranberry bogs	Tier 1	Extensive wetland restoration opportunities in cranberry bogs
BLSF-01	Beaver Brook/Bolivar Pond system, Canton	1.2	PFO	Dismiss	Existing upland appears natural and undisturbed
BLSF-02	Area of proposed frontage road, Stoughton	1.6	PFO	Dismiss	Existing upland appears natural and undisturbed
BLSF-03	Area of proposed frontage road, Stoughton	1.4	OW	Dismiss	Difficulty grading areas to match existing wetlands
BLSF-04	Black Brook/Easton golf course, Easton	1.5	PFO	Dismiss	Existing upland appears natural and undisturbed
BLSF-05	Black Brook/Easton golf course, Easton	1.5	PFO	Tier 2	
BLSF-06	Hockomock Swamp, Raynham	3.3	PFO	Dismiss	Existing upland appears natural and undisturbed

Site ID	Location	Size (ac)	Adjacent Cover Type	Category	Rationale
BLSF-07	East of Carver Street/Route 495, Raynham	1.5	PFO, PSS	Tier 1	Upland directly adjacent to wetland
BLSF-08	East of Carver Street/Route 495, Raynham	1.3	PSS	Tier 2	
BLSF-09	Pine Swamp, Raynham	3.2	PFO, PSS	Tier 1	Replaces impacted Pine Swamp flood storage
BLSF-10	Taunton River, Taunton	2.9	PFO	Dismiss	Active farmland

Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.
Shading denotes Tier 1 areas selected to be advanced to a conceptual design phase.

As previously discussed, the South Coast Rail project cannot fully comply with the performance standards of the WPA. While the regulations of the Act call for impacts to be mitigated onsite, not every impact along the right-of-way can practicably be mitigated for in a way that meets this criterion. Some areas of impacted BLSF cannot be replicated adjacent to the impact area due to surrounding development. Furthermore, detailed topographical information for all areas along the project corridor is not available at this level of design, and estimates of BLSF may change. Further analysis will be conducted in final design to more accurately estimate both the extent of BLSF and the effect of any impacted BLSF on the ability of the area to provide flood storage capacity.

Tier 1 Wetland Establishment Sites

Based on GIS analysis and agency review, the lists of sites were narrowed down to those sites with the highest potential value for wetland establishment or restoration. Based on input from the reviewing agencies, five sites were chosen from the preliminary list as having the highest potential for wetland establishment or restoration. Sites were renamed from their original designations (East 04, Rayn 04) to a simpler naming scheme (Site A, Site B) that will be used for the remainder of this report. The auto junkyard adjacent to Pine Swamp at East Brittania Street was also added to the list, as was Terry Brook Pond, for a total of seven sites that were advanced to a conceptual mitigation design stage. Wetland establishment and restoration opportunities are presented in Table 4.16-55 and existing conditions at each site and proposed mitigation are discussed individually.

Site A—Site A is in the Taunton River Watershed in Easton, east of Route 138 and north of the power line easement that cuts across a portion of the Hockomock Swamp. While not directly adjacent to the project right-of-way, this approximately 5.4 acre site is adjacent to a large area of forested wetland associated with the swamp. The site contains scrub-shrub areas and sparse trees, along with some unvegetated areas that appear to be the site of ATV use, based on aerial photography. The site has an elevation change of approximately 10 feet from the wetland edge to the upper limit of the site. The entire site is within rare species habitat and the Hockomock Swamp ACEC. Approximately one-third of the site is shown as existing protected open space based on a MassGIS data layer. A portion of the site also contains BLSF. This site was selected because it is an undeveloped area located adjacent to the wetland systems of the Hockomock Swamp. This site can provide over 5 acres of mitigation through wetland establishment. Although a change of grade of approximately 10 feet exists across the site, the upgradient area is also undeveloped and regrading of the topography to match the adjacent wetland landscape seems feasible.

Table 4.16-55 Tier 1 Wetland Establishment Sites

Site ID	Location	Size (ac)	Adjacent Cover Type	Watershed
A (formerly East-04)	Easton–north of power line easement on Route 138	5.4	PFO	Taunton
B (formerly Rayn-04)	Raynham–across ROW from dog track, Raynham	12.4	PFO	Taunton
C (formerly BLSF-07)	Raynham–east of Carver Street/Route 495	1.7	PFO	Taunton
D (formerly BLSF-09)	Raynham–Pine Swamp	3.5	PSS, PFO	Taunton
E	Raynham–Pine Swamp Junkyard	4.3	PSS, PFO	Taunton
F	Freetown–Terry Brook Pond	0.4	OW	Taunton
G (formerly Other-02)	Hanson–Burrage Pond WMA, between Elm Street and Route 27	61.3	PEM, PSS, PFO, Cranberry bogs	Taunton

Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub
PFO = Palustrine Forested

Site B—Site B is in the Taunton River Watershed in Raynham, directly west of the right-of-way, opposite the Raynham dog track. The site is approximately 12.4 acres in size and consists mainly of pavement over a large oval area once used as a dog training track, along with additional paved areas to either side of the track and one building. The site is currently used for trucking and other commercial purposes, along with an access road across the right-of-way. This site is also adjacent to Wetland R62.1, a perennial stream that has formed within the right-of-way. The northern end of the site includes a steep slope of over 10 feet down to the existing wetland areas, where the old dog track was built on a large area of fill. The difference in grade between the site and the surrounding landscape decreases from the northern end of the site to the southern end, which roughly matches the surrounding landscape. The site is surrounded on three sides by rare species habitat, and to the north by forested wetlands that are part of Hockomock Swamp. The entire site is located within the Hockomock Swamp ACEC. Along much of the northern portion of the site, the existing wetlands are close to or at the edge of pavement or the toe of the fill slope. It is likely that at least a portion of this site was originally constructed on top of wetlands. This site was chosen because it represents an opportunity to restore several acres of wetland areas that are currently covered by pavement and fill. Areas at the southern end of the site would be replanted as forested upland to provide additional rare species habitat. Based on agency input and feedback, this site was viewed as being one of the best opportunities along the project corridor for wetland establishment and restoration.

Site C—Site C is in the Taunton River Watershed in Raynham, west of the project right-of-way, just south of Carver Street and Interstate 495. This 1.7 acre site is approximately 200 feet from existing residential houses and yards, and is adjacent to wetlands that would be impacted from constructing the railroad. These wetlands include both forested wetlands and scrub-shrub areas near the site. The site also contains areas of BLSF. The existing vegetation is typical forested upland, interspersed with some patches of scrub-shrub vegetation. The elevation changes approximately 10 feet from the lowest to the highest point of the site, although along the margins the elevation change is only a few feet above the mapped wetland area. The parcel is not within any rare species habitat or protected open space. This site was selected because of its proximity to both impacted wetlands and impacted BLSF along the right-of-way of the South Coast Rail project. The site has the potential to provide approximately 1.5 acres of compensatory flood storage if used for wetland establishment.

Site D—This site is similar in nature to Site C. The site is in the Taunton River Watershed in Raynham, west of the right-of-way, near the municipal border between Raynham and Taunton. The area is approximately 3.5 acres and is adjacent to wetlands of the northern part of Pine Swamp. The wetlands adjacent to Site D consist of both forested and scrub-shrub wetlands, and BLSF is also supported within this site. Four potential vernal pools lie to the north and east of the site. The existing vegetation of Site D is a mix of forested upland, interspersed with some areas of scrub-shrub upland, and is approximately 200 feet from existing residential houses and yards. The elevation of the site is fairly uniform and is approximately 3 to 6 feet above the elevation of the existing wetlands. The entire site is located within rare species habitat. No part of the site is protected open space. This site was selected because of its proximity to Pine Swamp and wetland associated with Pine Swamp. Being adjacent to existing BLSF, this site also has the potential to provide over 3.0 acres of compensatory flood storage. Wetlands established at this site would also enhance wildlife habitat for species that use the four nearby potential vernal pools.

Site E—Site E is in the Taunton River Watershed in Raynham, directly east of the right-of-way, and is adjacent to wetlands of the southern part of Pine Swamp. This site is approximately 4.3 acres. The site is currently used as an auto junkyard, and aerial photography suggests that at least part of the junkyard is built on filled wetlands. The wetlands bordering Site E consist of large contiguous areas of both forested and scrub-shrub wetlands, and the site also supports BLSF. A portion of the site falls into an area of both rare species habitat and protected open space, which is also part of the existing degraded areas. The elevation of the site is fairly uniform and the site is approximately 3 to 6 feet above the elevation of the existing wetlands in most areas, although portions of the filled area appear from aerial photography to be very close to the elevation of the existing wetlands. This site was chosen because it represents an opportunity for both wetland establishment and restoration. While a detailed study of conditions at the junkyard would have to be undertaken in a further design stage, an establishment of wetlands in this area combined with restoration of degraded areas would benefit the adjacent wetlands of Pine Swamp. The site also has the potential to provide over 3.0 acres of compensatory flood storage.

Site F—Site F is adjacent to Terry Brook Pond in Freetown, in the Taunton River Watershed. Terry Brook Pond is a large area of open water approximately 13 acres on both sides of the right-of-way. Approximately 0.3 acre of the pond would be impacted by the project. Site E is approximately 0.4 acre on the northern side of the pond and is currently comprised of forested upland bordering the pond, with a walking trail or small boat launch ramp that leads down to the pond. Site E also supports BLSF, as does much of the immediate area surrounding the pond. The elevation of the site is a few feet above the existing water elevation. No part of the site is within rare species habitat, nor is any part of the site designated as protected open space. This site was chosen because it represents an opportunity to mitigate for open water impacts that occur in the same resource area (Terry Brook Pond). The small change in elevation and amount of adjacent upland available for grading would make the design of an open water area straightforward.

Site G—Site G, the Burrage Pond Wildlife Management Area, is a large complex of former cranberry bogs in Hanson, in the Taunton River Watershed. The portion under consideration for wetland establishment encompasses several bogs totaling approximately 61.2 acres. While MassDOT has reviewed the entire area with the reviewing agencies, and has prepared a mitigation design concept for the entire 61.2 acre area, the entire area may not be necessary to achieve the mitigation goals for the project. MassDOT would commit to constructing the amount of wetland establishment or restoration necessary to achieve the goals for the project, which may encompass a smaller area than shown in the proposed mitigation design concept. MassDOT would undertake wetland establishment and restoration

at this site in conjunction with the Massachusetts Division of Wildlife (MassWildlife), which owns and administers the WMA.

The Burrage Pond Wildlife Management Area is not located along the South Coast Rail project corridor. However, its large size and proximity to other wetland resources presents opportunities for wetland establishment and restoration of the old cranberry bogs. Despite Burrage Pond not being located along the project corridor, it is a large contiguous tract of land within the Taunton River watershed and reviewing agencies indicated that this area would be a good candidate for wetland establishment and restoration, as well as long-term stewardship through management by MassWildlife. The site is adjacent to a large marsh to the northwest and west, as well as forested and scrub-shrub wetlands to the east and southeast. The topography within the bogs is very uniform, with berms several feet high separating the bogs from one another and from the large swamp to the west and the forested wetlands to the east. A small portion of the forested wetland to the east consists of Atlantic white cedar swamp. The entire site is within rare species habitat and is also protected open space. This site was chosen for its extensive opportunities for wetland establishment and restoration of the old cranberry bogs. The site has previously been studied for the purpose of establishing a wetland bank area, and as such there is good historical information on the existing topography and hydrology.

Raynham Stream Relocation—Wetland R62.1 is the perennial stream that has formed within the former railroad right-of-way in Raynham. The site was investigated for the possibility of relocating the stream to the west of the right-of-way using Natural Channel Design techniques and to assess the functions and values of the stream.

The stream is not a natural formation that was channelized to construct the original railroad. Rather, drainage ditches were constructed on either side of the original railroad berm to channel water away from the berm. The ditches have become blocked and have diverted flow onto the right-of-way of the original railroad. A culvert under the Site B access road on the east side of the right-of-way is mostly blocked, resulting in water becoming impounded on the south side of the access road. During and after rain events, water overtops the bank and flows across the access road, discharging to the west side of the right-of-way.

A preliminary concept design of a relocated stream channel was prepared and presented to the consulting agencies. Constructing this stream channel would be difficult due to excavation through several feet of bedrock that would likely be required for much of the distance, and associated increase of the cost of the project. Additionally, relocating the stream into the adjacent forested upland would create impacts to existing box turtle habitat. For these reasons, the consensus of the agencies was that resources would be better spent elsewhere on other mitigation efforts.

Preservation Areas—Based on GIS analysis and agency review of the list of PPAs, sites that provide land preservation opportunities are presented in Table 4.16-56 below. The PPAs listed in Table 4.16-56 were first identified as part of a comprehensive Corridor Plan for the South Coast Rail project to address issues of smart growth. The Corridor Plan addresses economic development and land use related to the South Coast Rail project as a whole, and "provides a framework for regional growth that is clustered, more sustainable, and better connected within the region and to metro Boston." The Corridor Plan was developed in light of expected future increases in development along the project corridor due to the economic boost the project would provide to the area. The Corridor Plan identified PPAs along the project corridor and elsewhere in the region to identify areas of land or environmental resources not currently protected, but worthy of increased levels of protection. The USACE has indicated a willingness

to allow land preservation as one of a suite of mitigation options, to accompany the wetland establishment and restoration discussed in the previous section.

Table 4.16-56 Potential Land Preservation Opportunities

PPA #	Site Name	Municipality	Size (ac)	Has Priority Habitat	Has Vernal Pools	Category	Comments
P09	Gobi Property	Foxborough, Sharon	191	N	Y	Tier 2	
P14	Municipal Water Source and Future Well Site	Foxborough	77	PH 488/EH 392	Y	Tier 2	
P17	Canoe River ACEC (MAPC Region)	Foxborough	11	N	N	Dismiss	No wetlands – developable uplands adjacent to Willow St.
P20	Massapoag Sportmen's Club	Sharon	125	N	Y	Tier 2	
P22	Sreda Property	Sharon	88	PH 298/EH 198	Y	Tier 2	Includes land to north and west of original delineated parcel1
P24	Morse Farm	Sharon	40	PH 367/EH 233	N	Tier 2	Adjacent to existing protected open space
P25	Rattlesnake Hill	Sharon	339	PH 367/EH 233	Y	Tier 1	Adjacent to existing protected open space
P26	Echo Pond	Stoughton	60	N	Y	Tier 1	
P28	Benson Pond	Stoughton	102	N	Y	Tier 1	
P33	Clover Valley Farm	Easton	94	N	N	Tier 1	Includes additional land outside of original delineated parcel[1]
P34 A	Hockomock ACEC (OCPC Region)	Easton	315	PH 1392/EH 59	Y	Tier 2	Large cranberry bogs – review agencies determined to be lower priority
P34 B	Hockomock ACEC (OCPC Region)	Easton	131	PH 245/EH 132	Y	Tier 1	

PPA #	Site Name	Municipality	Size (ac)	Has Priority Habitat	Has Vernal Pools	Category	Comments
P34 C	Hockomock ACEC (OCPC Region)	Bridgewater	224	PH 1392/EH 59	Y	Tier 2	Large cluster of vernal pools – review agencies determined to be lower priority
P36	Taunton River/South Bridgewater/Cumberland Farm Land	Bridgewater	746	PH 1423/EH 34	Y	Tier 2	Restoration of ditched farm fields
P37	Taunton River	Bridgewater	151	PH 1423/EH 34	Y	Tier 2	Includes additional land to east of original delineated parcel[1]
P38	Bird Street Sanctuary	Stoughton	45	N	Y	Tier 1	Small portions of developable upland accessible
P40	Southworth Pond and Lipsky Fields	Stoughton	59	N	N	Tier 1	
P46 A	Upper Taunton River	Middleborough	228	PH 1421/EH 36	Y	Tier 2	
P46 B	Upper Taunton River	Raynham	393	PH 282/EH 179	Y	Tier 1	
P47	Great & Little Cedar Swamps	Halifax, Middleborough	2,579	PH 1332/EH 966	Y	Tier 2	Includes extensive farm areas
P49	Nemasket River - Farm Protection	Middleborough	186	PH 13/EH 77	Y	Tier 2	Protection of wetlands in northern portion
P50 A	Green Heart Corridor	Middleborough	997	N	Y	Tier 2	Cranberry bogs
P50 B	Green Heart Corridor	Middleborough	523	PH 226/EH 107	Y	Tier 2	
P51	Thatcher Pond	Taunton	180	PH 1421/EH 36	Y	Tier 1	Adjacent to existing protected open space
P52	Runnins River Headwaters	Seekonk	292	PH 724/EH 661	Y	Tier 2	
P53	Palmer River Aquifer/Zone II Protection Area	Rehoboth	198	N	Y	Tier 2	
P54	Muddy Cove Brook	Dighton	207	N	Y	Tier 2	
P55	Lower Taunton River Protection Area	Berkley	50	N	Y	Tier 1	Area adjacent to existing protected open space

PPA #	Site Name	Municipality	Size (ac)	Has Priority Habitat	Has Vernal Pools	Category	Comments
P56	Acidic Fen	Freetown	255	PH 1379	Y	Tier 1	
P58	Greenway Connection	Freetown	1,583	PH 303/EH 204, PH 1239/EH 177	Y	Tier 2	Surrounds small box of existing protected open space
P59	Mattapoisett River Aquifer Protection Area	Rochester	1,138	PH 1330/EH 58	Y	Tier 2	
P60	Aucoot Cove	Marion	49	PH 15/EH 79	N	Tier 2	Frontage to existing road
P61	Pine Barrens/Aquifer Protection Area	Wareham	1,341	PH 1396/EH 862/EH 969, PH 858, PH 859	Y	Tier 2	Developable uplands in central section of parcel
P62	Bioreserve (Infill)	Westport	275	N	Y	Tier 2	Evidence of previous subdivision road layout
P63 A	Acushnet Swamp	Dartmouth	176	PH 1349/EH 1	Y	Tier 1	
P63 B	Acushnet Swamp	Dartmouth	196	PH 1349/EH 1	N	Tier 1	
P66	Aponagansett Cove	Dartmouth	189	PH 922/EH 751	Y	Tier 2	Out-of-kind mitigation
P69	Nasketucket Bay State Reservation Area	Mattapoisett, Fairhaven	185	PH 15/EH 79	N	Tier 2	

Shading denotes Tier 1 areas.

1 ”Original delineated parcel” refers to parcels as shown on the Corridor Plan map.

The number of sites and total area in Table 4.16-56 is much larger than any potential area needed for preservation. At the current level of design for the project, the amount of land potentially needed for preservation is not known. Preservation would be used if the area of federal wetland mitigation needed would not be fully achieved by wetland establishment and restoration. The sites listed in Table 4.16-56 provide a broad range of possible sites to ensure that opportunities for preservation can be developed once exact amounts of preservation acreage needed are known.

The preliminary list was reviewed by MassDOT and the reviewing agencies to determine the sites most likely to provide preservation opportunities for both wetlands and developable uplands. Factors deemed important for a site to provide good preservation opportunities were:

- Proximity of the site to the project corridor, particularly in municipalities or communities that would experience wetland or other environmental impacts;
- Proximity to the Hockomock Swamp, which was given priority by the reviewing agencies;

- Diversity of wetland and upland cover types at the site;
- Amount of undeveloped upland at the site, particularly if the undeveloped upland could feasibly be developed in the future; and
- Other known or potential environmental resources at the site, such as rare species habitat or clusters of certified or potential vernal pools.

Based on agency input, the PPAs were divided into two groups, Tier 1 and Tier 2. Tier 1 sites have a higher potential to provide preservation opportunities. Tier 2 sites would be considered only if not enough wetland preservation can be achieved from Tier 1 sites.

Appendix 4.16-D includes graphics showing each of these areas, along with their size and any adjacent wetlands, rare species habitat, and other environmental factors.

Summary

Sites have been chosen that based on review of available information, along with input from review agencies. The sites described in this chapter represent Tier 1 sites that have a high likelihood of being able to replace wetlands impacted by the South Coast Rail project. However, should one or more of these sites prove to be not practicable for wetland establishment or preservation and additional area is needed, Tier 2 sites can be examined. Based on the review of available information and agency input, the sites presented in this report for wetland establishment, restoration, enhancement and preservation are all located in the Taunton River Watershed. While other watersheds through which the project passes are affected, The Taunton River Watershed comprises 88 percent of the wetland impact along the right-of-way for the Stoughton Electric Alternative and 86 percent for the Whittenton Alternative. Although Tier 1 sites for wetland establishment were not identified in other watersheds at this design stage, potential areas for preservation have been identified in all project watersheds.

The MassDEP wetland mitigation guidance document calls for wildlife habitat evaluations of wetland areas impacted by a project, in order to facilitate the replication of the wildlife functions provided by the area. Detailed wildlife habitat evaluations of impacted areas of the South Coast Rail project would be undertaken during the final design phase of the project. This may require adjustments to the amount or type of wetlands to be replicated in order to provide adequate mitigation for impacted wildlife habitat and other functions and values.

There are watershed action plans outlining overall goals within Buzzards Bay, Mount Hope Bay, Neponset River, and Taunton River Watersheds. Mitigation efforts would be coordinated with the different associations and follow their action plans to the extent possible. The Buzzards Bay Comprehensive Conservation and Management Plan[37] (originally created in 1991 and currently being revised), Mount Hope and Narragansett Bay Five-Year Action Plan[38], Neponset River Watershed Action Plan (part of the Boston Harbor Watersheds 2004 2009 Action Plan[39]) and the Five-Year Watershed

[37] Buzzards Bay Project. Buzzards Bay Comprehensive Conservation and Management Plan, August 1991

[38] Massachusetts Executive Office of Environmental Affairs. Mount Hope and Narragansett Bay Five-Year Action Plan. November 2004.

[39] Massachusetts Executive Office of Environmental Affairs. Boston Harbor Watersheds 2004 - 2009 Action Plan, November 2004.

Action Plan for the Taunton River[40] would be consulted when creating final mitigation goals and selecting mitigation locations. Several of the plans are being revised or updated to accurately reflect current conditions within the watershed. The most recent plan available for each impacted watershed would be used to guide mitigation efforts once the preferred alternative is selected.

4.16.10.4 Proposed Compensatory Mitigation

Based on input from reviewing agencies and GIS analyses, the initial list of 25 potential wetland establishment sites was narrowed down to five sites. An additional two sites raised in discussions with the reviewing agencies (the auto junkyard adjacent to Pine Swamp and Terry Brook Pond) were also added to the final list, for a total of seven final sites to be advanced to a conceptual mitigation design. This chapter describes the proposed wetland compensatory mitigation package. Figures are provided showing the existing conditions at each parcel, along with a proposed design concept.

Methodology

The following sections describe the methodology used for the conceptual mitigation designs in each proposed wetland establishment site.

Overall Design and Elevation

Conceptual mitigation design began with a detailed analysis of the Tier 1 establishment and restoration sites using GIS software. Based on input from the reviewing agencies, Light Detection and Ranging (LiDAR) elevation data was added to the analysis of the sites. The LiDAR dataset is a fairly recent (released in July 2012) dataset produced by Massachusetts Office of Geographic Information (MassGIS). LiDAR data, while not as accurate as a ground survey of topography, produces finer-scale topographical information than the existing state elevation data layers, which show elevation only in 3 meter (10 foot) increments. After processing the LiDAR data, elevation contours at the wetland establishment sites were generated at 1 meter (3.3 foot) intervals.

The use of LiDAR data enabled more detailed analysis of elevation at these sites, and allowed for more detailed mitigation design concepts that incorporated proposed grades into the design. Proposed grades were included in the concept design for each wetland establishment area, to determine if grading was practicable at the site and if the elevation of the existing wetland areas could be matched in the adjacent wetland establishment area, with enough surrounding space to regrade the upland buffer to match existing grades.

Vegetation Types and Mitigation Goals

The general vegetation types used in the design concept for each wetland establishment site were based on the Cowardin classification of the natural vegetation of the wetlands adjacent to each site. Generally, the design concepts propose equivalent vegetation types adjacent to existing vegetation types, such as palustrine forested wetland adjacent to existing palustrine forested wetlands and scrub shrub wetlands adjacent to existing scrub-shrub wetlands. Using this design framework is more likely to result in the successful establishment of the target plant communities. The minimum mitigation ratios

[40] Massachusetts Executive Office of Environmental Affairs. Five-Year Watershed Action Plan for the Taunton River Watershed, September 2006

given in the USACE's Compensatory Mitigation Guidance were the basis for the total mitigation acreage goals for each vegetation type. These minimum mitigation ratios and total acreage goals were considered when creating the mitigation concept designs for each site. The sum of the proposed acreage of each vegetation type at all sites seeks to meet or exceed the previously stated mitigation goals. This allows for adjustments to the total mitigation goals that may be necessary in final design. The sum of each vegetation type also meets or exceeds the mitigation goals laid out in the MassDEP's Inland Wetland Replication Guidelines. The guidelines include a requirement that at least 75 percent of the surface of the replacement area be established with indigenous wetland plant species within two growing seasons.

Planting Plans

Planting plans were developed based on each vegetation type proposed for establishment at each site. Recommended plant lists are included for palustrine forested, palustrine scrub-shrub, and palustrine emergent wetland areas. These plant lists are general recommendations, and species may change in final design. Plant lists were generated using species native to Massachusetts and New England, and do not use invasive species, such as those listed on the Massachusetts Prohibited Plant List[41]. Plant lists for palustrine forested wetlands (Table 4.16-57) palustrine scrub-shrub wetlands (Table 4.16-58) and palustrine emergent wetlands (Table 4.16-59) are designed to create a representative plant community based on the surrounding or adjacent vegetation. In addition, certain areas such as the Burrage Pond site may lend themselves to restoration of Atlantic white cedar habitat; although the regulated activities noted above are not expected to measurably affect existing Atlantic white cedar swamps, USACE intends to encourage this and other opportunities to restore this increasingly rare habitat type.

Table 4.16-57 CONCEPTUAL Planting Specifications, Palustrine Forested Wetlands

Common Name	Latin Name	Wetland Indicator Status	Spacing
Red maple	*Acer rubrum*	FAC	20 ft. oc[1]
Tupelo	*Nyssa sylvatica*	FAC	20 ft. oc
Eastern hemlock	*Tsuga canadensis*	FACU[2]	20 ft. oc
Yellow birch	*Betula alleghaniensis*	FAC	20 ft. oc
Atlantic white cedar	*Chamaecyparis thyoides*	OBL	10 ft. oc
Inkberry	*Ilex glabra*	FACW	12 ft. oc
Winterberry	*Ilex verticillata*	FACW	12 ft. oc
Highbush blueberry	*Vaccinium corymbosum*	FACW	12 ft. oc
Sweet pepperbush	*Clethra alnifolia*	FAC	100 /ac
Cinnamon fern	*Osmunda cinnamomea*	FACW	100 /ac
Sensitive fern	*Onoclea sensibilis*	FACW	100/ ac

oc = on center
Listed as a wetland indicator in the Massachusetts Wetland Protection Act.

[41] Massachusetts Department of Agriculture Resources, Massachusetts Prohibited Plant List. Effective January 1, 2009. http://www.mass.gov/agr/farmproducts/prohibitedplantlist.htm, accessed November 4, 2012.

Table 4.16-58 CONCEPTUAL Planting Specifications, Palustrine Scrub-Shrub Wetlands

Common Name	Latin Name	Wetland Indicator Status	Spacing
Speckled alder	*Alnus incana*	FACW	12 ft. oc
Winterberry	*Ilex verticillata*	FACW	12 ft. oc
Pussy willow	*Salix discolor*	FACW	12 ft. oc
Buttonbush	*Cephalanthus occidentalis*	OBL	12 ft. oc
Inkberry	*Ilex glabra*	FACW	12 ft. oc
Highbush blueberry	*Vaccinium corymbosum*	FACW	12 ft. oc
Arrowwood	*Viburnum dentatum*	FAC	8 ft. oc
Silky dogwood	*Cornus amomum*	FACW	8 ft. oc
Red-osier dogwood	*Cornus alba*	FACW	8 ft. oc
Swamp azalea	*Rhododendron viscosum*	FACW	8 ft. oc
Tussock sedge	*Carex stricta*	OBL	100 /ac

oc = on center

Table 4.16-59 CONCEPTUAL Planting Specifications, Palustrine Emergent Wetlands

Common Name	Latin Name	Wetland Indicator Status	Spacing
Meadowsweet	*Spiraea alba*	FACW	100/ac
Steeplebush	*Spiraea tomentosa*	FACW	100/ac
Marsh marigold	*Caltha palustris*	OBL	100/ac
Bearded sedge	*Carex comosa*	OBL	100/ac
Tussock sedge	*Carex stricta*	OBL	100/ac
Fox sedge	*Carex vulpinoidea*	OBL	100/ac
Boneset	*Eupatorium perfoliatum*	FACW	100/ac
Soft rush	*Juncus effusus*	FACW	100/ac
Cardinal flower	*Lobelia cardinalis*	FACW	100/ac
Hard-stem bulrush	*Scirpus acutus*	OBL	100/ac
Green bulrush	*Scirpus atrovirens*	OBL	100/ac
Woolgrass	*Scirpus cyperinus*	FACW	100/ac
Soft Stem bulrush	*Scirpus tabernaemontani*	OBL	100/ac

oc = on center

Soils

Soils used for wetland establishment sites would either be translocated (i.e., existing wetland soils from impacted wetland areas would be reused) or created with soil amendments. While translocation is the preferred method stated in the MassDEP mitigation guidance, created wetland soils may also be used. Generally, wetland soils are created from a 1:1 mixture (or equal volumes) of organic and mineral materials, with the final product containing at least 12 percent organic carbon by weight. According to USACE's guidance, soils to be used for emergent wetlands in permanently or semi permanently flooded areas should have a target organic carbon level of 4 to 6 percent. Soil specifications would be generated for each wetland establishment site to include a description of the composition of the existing soil, added material, and the techniques used in its preparation. A detailed schedule would be developed for

the collection and stockpiling of soils. No soil used for creation of wetland soils would be taken from any area supporting invasive species.

Wildlife Habitat Features

In addition to wetland plantings and establishment of appropriate wetland hydrology within each wetland establishment site, wildlife habitat features would be used wherever feasible. The creation of hummock and hollow microtopography where appropriate creates burrowing opportunities. Any large rocks or boulders uncovered during excavation would be left in place or set aside to be reused. These can provide nesting, burrowing, and hiding places. Fallen logs and woody debris provide important cover and foraging habitat to a variety of wildlife species. Logs and woody debris in varying stages of decay can be used to provide habitat features. Upland tree species close to the wetland boundary may not be affected by excavation, but are likely to suffer mortality in the increased hydrologic regime of the newly established wetland. These trees can be left to stand in place, and when they die they will provide snags for perching, foraging, and nesting opportunities for a variety of bird species including woodpeckers. Alternatively, whole trees can be pushed over into the newly established wetland to provide wildlife habitat features.

Construction Guidelines

Construction of the wetland establishment sites would seek to minimize erosion and sedimentation into existing wetlands, and to maximize the establishment and survival of plantings. Final mitigation plans would be developed for each wetland establishment site based on a detailed updated topographic survey, groundwater monitoring, test borings, and soil sampling. The replacement wetlands would be designed to conform to the guidelines developed by the USACE and MassDEP guidance and to meet the performance standards in the WPA regulations.

The construction of the wetland establishment sites would involve excavation of the non-wetland areas adjacent to the existing wetlands. The excavation would bring the elevation of the non-wetland areas down to the grade of the existing wetlands or lower, depending on the type of vegetational community desired. The excavation would bring the replacement areas into contact with groundwater, which establishes a hydrologic connection to a water source of sufficient volume and duration to maintain wetland hydrology. This in turn supports wetland vegetation and the development of hydric soils. Each site would be graded with microtopography to mimic the surface of the wetlands that will be impacted.

Each wetland establishment site would be vegetated (planted) with native wetland species in accordance with USACE and MassDEP guidance, and in accordance with the previous plant lists. In final design, dominant native wetland plant species observed in the existing wetlands adjacent to a wetland establishment site may be substituted for plants in the previous plant lists.

Construction Oversight

The construction of successful replacement wetland sites would require oversight by a supervising wetland scientist who is an experienced field professional. The supervising wetland scientist may need to make field adjustments in grading and/or planting in response to field conditions at each wetland establishment site. These modifications can ensure that hydrologic conditions necessary to support wetland vegetation and functions are created. During construction, the supervising wetland scientist may relocate up to 50 percent of the plantings if conditions require.

Construction Sequence

A general sequence of construction events follows.

- Before construction begins, an erosion control barrier would be erected around the entire proposed wetland replacement site, except the upgradient edge to allow machinery access to the site. The erosion control barrier prevents erosion of disturbed soils and sedimentation into the adjacent existing wetland areas.

- The wetland establishment site would be cleared and grubbed, and would be excavated to a depth of 12 inches below the final design elevation. In response to subsurface hydrologic conditions, the supervising wetland scientist may make minor modifications to the rough grading plan in the field. The supervising wetland scientist would inspect the sub-grade of the wetland establishment site to ensure that wetland hydrology has been established.

- The wetland establishment site would then be backfilled with wetland soils that have either been translocated or created. Hydric soils that are created would follow the guidelines discussed above. Once the final topsoil is in place, it would be graded to achieve a topography to match the existing adjacent wetland, or to achieve topography of the target wetland cover type. Often, a slight hummock/hollow microtopography simulates a natural substrate. Additionally, low spots would be created within the wetland establishment site to provide temporary ponding of surface waters.

- Rocks and boulders uncovered during the excavation may be left in place, provided they do not result in a large decrease in the plantable area of the wetland establishment site. If possible, rocks and boulders would be repositioned to provide crevices and cavities suitable for wildlife use.

- Fallen logs and other woody debris would be distributed in the wetland establishment site to provide beneficial habitat features for wildlife. Woody material would be distributed to cover approximately 2 percent of the site's surface area. Logs and woody debris would be of various sizes and in various degrees of decomposition.

- After work with heavy machinery is completed, an erosion control barrier would be erected along the upgradient edge of the wetland establishment site.

- Plantings would take place according to the planting schedule of the final design of each wetland establishment site, which would specify species, size, and quantity of plantings. Prior to delivery to the site, the supervising wetland scientist would visit the nursery or nurseries providing the planting stock to ensure that the specimens are healthy, free from pests and any invasive plant material, and suitable for use within the wetland establishment site. Unsuitable specimens would be rejected and replaced with suitable specimens. The supervising wetland scientist must approve any planting substitutions. All woody plant stock would be either bare root stock or container grown. Planting within the wetland establishment site and adjacent uplands would conform to the plans or would be completed in accordance with directions provided in the field. Only plant materials native and indigenous to the region would be used. Use of cultivars would be prohibited. Species not specified in the final planting plan would not be used without written approval from the permitting agency.

- All plantings would be spaced in similar species clusters in a random distribution, at the direction of the supervising wetland scientist, to simulate natural growth patterns.

- Upon completion of planting, the areas around each plant or cluster or plants would be mulched with a 2 inch thick layer of leaf litter or other natural organic material (not fresh wood chips)

- The erosion control barriers would be disassembled and properly disposed of before November 1 of the third full growing season after planting of the wetland establishment site. Sediment collected by the barriers would be removed and disposed of in a manner that prevents erosion and transport to a wetland or waterway. If minor grading is required in the immediate zone around the erosion control barrier to provide surface hydrologic connection between the wetland establishment site and the existing wetland area, it would be done by hand and stabilized by mulch.

- The wetland establishment site would be inspected twice a year, during the spring and fall, each year of the post construction monitoring period for invasive or unwanted plants. If invasive species are found, they would be uprooted and removed from the area, and/or treated with a glyphosate herbicide approved for wetland use and applied by hand. Invasive plants are discussed in more detail below.

- Long-term monitoring of the wetland establishment site would be conducted as recommended below.

Invasive Species Control Plan

Exotic or invasive species commonly observed in the surrounding landscape may colonize wetland establishment sites as the vegetation community develops. These species potentially include:

- *Alliaria petiolata*, garlic mustard

- *Berberis thunbergii*, Japanese barberry

- *Lonicera* spp., shrub honeysuckle

- *Lysimachia nummularia*, moneywort

- *Lythrum salicaria*, purple loosestrife

- *Phalaris arundinacea*, reed canary grass

- *Phragmites australis*, common reed

- *Frangula alnus*, glossy buckthorn

- *Rosa multiflora*, multiflora rose

- *Solanum dulcamara*, bittersweet nightshade

To protect the functions and integrity of wetland replacement sites, each site would be inspected twice a year as part of the long term monitoring plan for the site. If feasible, any exotic or invasive plants would be pulled by hand and removed from the wetland replacement site. In the event that herbaceous species become established and hand removal is not feasible, a qualified pesticide applicator would be contacted to spray plants with an appropriate herbicide. Spraying would be done using a backpack unit and dye mixed with the liquid herbicide to minimize overspray and damage to native wetland species.

Post Construction Monitoring

This section provides a monitoring and assessment plan for the wetland establishment sites. A 10 year monitoring period is proposed.

Field Monitoring and Report Schedules

Monitoring reports would be prepared, based on field observations, in the format required by the USACE New England District Mitigation Guidance[42]. Monitoring of field conditions would be performed for each of the first three full growing seasons following construction of the wetland establishment sites. Observations would occur at least two times during the growing season (in late spring/early summer and again in late summer/early fall). Each annual monitoring report would be submitted to the USACE and MassDEP no later than December 15 of the year being monitored. Failure to perform the monitoring and submit a monitoring report would constitute permit non-compliance. A self-certification form would be completed, and signed as the transmittal coversheet for each annual monitoring report and would indicate the permit number and the report number. The reports would address success standards in the summary data section and would address any additional items noted in the monitoring report requirements. The reports would also include the monitoring report appendices listed below. The first year of monitoring would be the first year that the wetland establishment sites have been through a full growing season after completion of construction and planting. For the purpose of this monitoring effort, a growing season starts no later than May 31. If there are problems that need to be addressed and if the measures to correct them require prior approval from the agencies, MassDOT would contact the agencies as soon as the need for corrective action is discovered.

Remedial measures would be implemented at least one year prior to the completion of the 10-year field monitoring period, to attain the success standards within three growing seasons after completion of construction of the wetland establishment sites. Should measures be required within one year of the end of the 10-year field monitoring period, the monitoring period would be extended as necessary to demonstrate success of the mitigation site after the remedial work is completed. Measures requiring earth movement for changes in hydrology would not be implemented without written approval from the USACE and MassDEP.

At least one reference site adjacent to or near each wetland establishment site would be described and shown on a locus map.

[42] U.S. Army Corps Of Engineers New England District Regulatory Division. 2010. New England District Compensatory Mitigation Guidance. Concord MA.

Field Monitoring Methods

Vegetation, soils, and hydrology development would be monitored within the wetland establishment site and at a reference site established in the adjacent wetland. The following data would be collected in the wetland establishment site and the reference site during each site visit:

- Two monitoring wells would be installed in the wetland establishment site and the reference site, and shown on a plan;
- Two sediment horizon markers would be established in the wetland establishment site and the reference site to characterize sediment accumulation;
- Water table height would be measured two times per year, during site visits;
- Sediment accumulation;
- Percent vegetative cover;
- Species composition, with reference to wetland indicator status;
- Height and stem density for dominant target species and invasive species; and
- Evidence of wildlife use of the area (tracks, scat, dens, nests, or evidence of browsing.

Success Standards

Each monitoring report would answer the following questions (success standards):

- Does the wetland establishment site have the hydrology, as demonstrated by observations of monitoring well levels, to support the designed wetland type?
- Is the proposed hydrology met at the site?
- What percentage of the site is meeting project hydrology levels? Areas that are too wet or too dry should be identified along with suggested corrective measures.
- Does the wetland establishment site have at least 80 percent aerial cover of non-invasive hydrophytes, excluding planned open water areas or planned bare soil areas?
- Are invasive species being controlled so that the aerial cover of invasives is less than 5 percent?
- Does data from the substrate cores and horizon markers show increasing organic carbon content and sediment accumulation over time?
- Are all slopes, soils, substrates and constructed features within and adjacent to the wetland establishment area stabilized?

Monitoring Report Requirements

Each monitoring report would address the following items:

- Dates that work began and ended.
- Description of monitoring inspections since the last report.
- Soils and hydrology data.
- Remedial actions undertaken to meet success standards.
- Status of erosion control measures.
- Visual estimates of total percent cover, and visual estimate of percent cover of invasive species.
- General health and vigor of each of the plant species in the wetland establishment sites, with diagnosis of cause(s) of morbidity or mortality.
- Evidence of wildlife use.
- Remedial measures recommended to achieve or maintain success, and improve the extent to which the wetland establishment site replaces the lost functions and values.
- Each monitoring report would include four appendices:
- A copy of the permit, with mitigation special conditions and mitigation goals.
- An as-built planting plan showing the location and extent of the designed plant community type. (This is required only in the first monitoring report.)
- A species list of volunteer plant species in each community type.
- Representative photos of each mitigation site, taken from the same location for each monitoring event.

Final Assessment

A final post-construction assessment of the condition of the wetland establishment site would be performed at the end of the 10 year monitoring period. The assessment report would be submitted to the USACE and MassDEP by December 15 of the year the assessment is conducted. This assessment would:

- Summarize the original or modified mitigation goals and discuss the level of attainment of these goals.
- Describe significant problems and solutions during construction and post-construction.

- Identify agency procedures or policies that encumbered implementation of the mitigation plan. The assessment will specifically note procedures or policies that contributed to lower success or effectiveness than anticipated.

- Recommend measures to improve efficiency, reduce cost, or improve effectiveness of similar projects.

- The assessment will include the following appendices:

- Summary of the functions and values assessment of the wetland establishment areas.

- Calculation of the area of wetlands in each site, accompanied by a scaled drawing showing the wetland boundary and representative transects, with data sheets supporting the delineation.

- Comparison of the area and extent of delineated constructed wetlands with the area and extent of created wetlands proposed in the mitigation plan.

- Photos of the wetland establishment site taken from the same locations as the monitoring photos.

Tier 1 Wetland Establishment Sites

Five sites were selected as Tier 1 wetland establishment sites. The auto junkyard adjacent to Pine Swamp at East Brittania Street and Terry Brook Pond were also added to the list, for a total of seven sites that were advanced to a conceptual mitigation design stage. Six of the sites are located along the project corridor, or in the case of Site A, adjacent to the same wetland complex (the Hockomock Swamp) as the project corridor. The seventh site is Burrage Pond in Hanson, which is not located along the project corridor but that provides extensive wetland establishment and restoration opportunities. The following sections describe the proposed wetland concept design for each wetland establishment site.

Site A—Site A is approximately 5.4 acres, and the entire site is adjacent to existing forested wetland, at an elevation of approximately 71 feet. Figure 4.16-6 shows the existing conditions at Site A. Forested wetland is proposed for this site, since it is the vegetation type that would have the highest likelihood of long term success at this site and would expand the existing forested wetland. Wetland establishment at this site would create approximately 5.4 acres of new forested wetland, by excavating down to the existing wetland elevation of 71 feet to establish wetland hydrology. Wetlands created here would also provide approximately 4.9 acres of compensatory flood storage by expanding the existing floodplain over the created wetland.

Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, and threatened or endangered species habitat. The area outside the wetland replacement site would be graded to match the existing topography Approximately 2.4 acres of additional upland would be required for grading, resulting in 7.8 acres of land acquisition needed to construct this wetland establishment site. Figure 4.16-7 shows the proposed wetland establishment design concept plan for this Site A.

Site B—Site B is approximately 12.4 acres. This site is partially built on fill material, particularly at the northern end of the old dog track (now paved) that makes up the central portion of this site. While the elevation of the northern portion of the site is currently 15 feet or more above the elevation of the existing wetlands, the hydrology of the surrounding area suggests that wetland restoration is possible at approximately half of the site through removal of fill material that was likely placed on top of wetlands. Figure 4.16-8 shows the existing conditions at Site B.

The existing pavement and enough fill material would be removed to match the elevation of Site B with the elevation of the existing wetlands to the north and west (approximately elevation 91 feet). Additionally, a channel would be rebuilt along the west side of the right-of-way to contain the perennial stream in Wetland R 62.1. The stream would flow into the wetlands adjacent to Site B, partially restoring the hydrology to this area and increasing the likelihood of long term successful hydrology at Site B. Wetland reestablishment at this site would result in approximately 6.5 acres of restored wetland area. As with Site A, the surrounding wetlands are entirely forested, so the proposed wetland reestablishment would produce additional forested wetlands here, and would restore the functions of the wetlands originally filled to construct the dog track. Although Hockomock Swamp to the north contains Atlantic white cedar, the wetlands surrounding Site B do not, and the hydrology of the area does not support this species.

Functions and values provided by the newly reestablished wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, and threatened or endangered species habitat. The southern half of the site would be cleared of existing pavement and would be planted as upland forest, resulting in approximately 5.9 acres of restored upland. This area would provide additional wildlife habitat as well as rare species habitat. Figure 4.16-9 shows the proposed wetland establishment design concept for Site B.

Site C—Site C is approximately 1.7 acres and is surrounded on three sides by forested and scrub-shrub wetlands that begin at an elevation of approximately 81 feet. This site also provides flood storage as BLSF, at an elevation of approximately 81 feet. Figure 4.16-10 shows the existing conditions at Site C.

Wetland establishment would result in approximately 1.2 acres of forested wetland and 0.5 acre of scrub-shrub wetland, by excavating down to the wetland elevation of 81 feet to establish wetland hydrology. Wetlands created here would also provide approximately 1.5 acres of compensatory flood storage by expanding the existing floodplain over the created wetland.

Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, and wildlife habitat. The area outside the wetland replacement site would be graded to match the existing topography. Approximately 0.4 acre of additional upland would be required for grading, resulting in 2.1 acres of land acquisition required to construct this wetland establishment site. Figure 4.16-11 shows the proposed wetland establishment design concept for Site C.

Site D—Site D is approximately 3.5 acres and is adjacent to forested and scrub-shrub wetlands that begin at an elevation of approximately 62 feet. This site also provides flood storage as BLSF at an elevation of approximately 60 feet. Figure 4.16-12 shows the existing conditions at Site D.

Wetland establishment at Site D would seek to create three different wetland cover types. The presence of potential vernal pools near the eastern edge of the site provides evidence of hydrology that could support an area of palustrine emergent wetlands by excavating down to an elevation of approximately 59 feet. This would provide approximately 1.1 acres of emergent wetland. Grading to an elevation of approximately 61 feet would create approximately 1.2 acres of scrub-shrub wetland in the middle third of the site. Finally, grading to an elevation of approximately 62 feet would create approximately 1.2 acres of forested wetland. Wetlands created at Site D would also create approximately 3.1 acres of compensatory flood storage by expanding the existing floodplain over the created wetland.

Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, and threatened or endangered species habitat. Minimal grading would be needed to match the created wetland with the existing upland. Figure 4.16-13 shows the proposed wetland establishment design concept for Site D.

Site E—Site E is the automotive junkyard and is approximately 4.3 acres, adjacent to forested and scrub-shrub wetlands that begin at approximately elevation 59 feet. This site also provides flood storage as BLSF at approximately elevation 60 feet. Figure 4.16-14 shows the existing conditions at Site E.

Wetland establishment would result in approximately 2.2 acres of forested wetland and 2.1 acres of scrub-shrub wetland at Site E, by excavating to elevation 59 feet to establish wetland hydrology. Wetlands created here would also provide approximately 3.2 acres of compensatory flood storage by expanding the existing floodplain over the created wetland. Wetland restoration would also be constructed in current BLSF and within upland areas on the site degraded by the auto junkyard. From aerial photography, portions of the site appear to be filled wetlands.

Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, and threatened or endangered species habitat. Minimal grading would be needed to match the created wetland with the existing upland. Figure 4.16-15 shows the proposed wetland establishment design concept for Site E.

Site F—Site F is approximately 0.4 acre and is adjacent to Terry Brook Pond, which has a shoreline elevation of approximately 55 feet. This site provides flood storage as BLSF at an elevation of approximately 56 feet. Figure 4.16-16 shows the existing conditions at Site F.

Wetland establishment would result in approximately 0.4 acre of open water at Site F by excavating below the wetland elevation of 55 feet to establish wetland hydrology. Establishment of open water at this site would compensate directly for the South Coast Rail project impacts to Terry Brook Pond. Wetlands created here would also create approximately 0.4 acre of compensatory flood storage area, by expanding the existing BLSF.

Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, fish and shellfish habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, sediment/shoreline stabilization, wildlife habitat, recreation, and visual quality/aesthetics. The area outside the wetland replacement site would be graded to match the existing topography. Minimal grading would be needed to match the created wetland with the existing upland. Figure 4.16-17 shows the proposed wetland establishment design concept for Site F.

Site G—Site G (the Burrage Pond WMA) represents the largest wetland establishment site at 61.3 acres. As discussed previously, Site G is not along the project corridor, but would provide opportunity for extensive wetland establishment and restoration where there are now abandoned cranberry bogs. While MassDOT has evaluated the entire area with the reviewing agencies and has prepared a mitigation design concept for the entire 61.2 acre site, the entire site may not be necessary to achieve the mitigation goals for the project. MassDOT would commit to constructing the amount of wetland establishment necessary to achieve the goals for the project, which may encompass a smaller area than shown in the proposed mitigation design concept. MassDOT would undertake wetland establishment and restoration at this site in conjunction with MassWildlife, who owns and manages the WMA.

The site was previously the focus of study for a potential wetland banking pilot program, and as such there is historical information on the size and extent of the site as well as a previous wetland mitigation design concept. The previous design concept focused on three areas of the site (Areas A, B, and C). Two of these, Areas A and C are part of Site G; Area B is not part of Site G and will not be discussed further. In addition to Areas A and C, three additional locations of the site (referred to as Areas D, E, and F) have been studied by MassDOT for this potential wetland establishment site. Table 4.16-60 lists the different areas of Site G and their size in acres. All five areas are abandoned cranberry bogs enclosed by earthen berms. Figure 4.16-18 shows the existing conditions at Site G.

Table 4.16-60 Site G Areas

Area	Description	Size (acre)	Current Elevation (feet)
A	Single large bog	15.0	65
C	Single large bog	27.3	59
D	Two small bogs separated by berm	10.7	62
E	Two small bogs separated by berm	6.6	62
F	Single small bog	1.7	59/62

Mitigation at Site G would consist of wetland establishment and restoration. The entire area is already classified as wetland cranberry bogs, with the exception of the berms surrounding the bogs. Wetland establishment and creation at this site would create a diversity of wetland cover types. The following sections detail the wetland establishment proposed for each area. Figure 4.16-19 shows the proposed wetland establishment design concept for Site G.

Area A is a single large bog of approximately 15.0 acres and has the highest elevation of any portion of Site G at approximately 65 feet. Forested wetland is proposed for this location. Wetland establishment would create approximately 15.0 acres of forested wetland at Area A. Existing berms around the perimeter of Area A would be retained. Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, educational/scientific value, and threatened and endangered species habitat.

Area C is a single large bog that is approximately 27.3 acres and has the lowest elevation at Site G of approximately 59 feet. Forested wetland is proposed for this area, with a focus on providing habitat for Atlantic white cedar. Atlantic white cedar swamps are considered imperiled in Massachusetts by the NHESP. Standing water in these habitats generally occurs for half the year or longer. Wetland

establishment would create approximately 27.3 acres of forested wetland within Area C. Further study would be required to determine the acreage that could feasibly be devoted to Atlantic white cedar. The existing berms on the east and south sides of Area C would be removed to connect this area to the adjacent wetland community. The existing berms on the north and west sides of Area C would be left in place. Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, uniqueness/heritage, educational/scientific value, and threatened and endangered species habitat.

Area D consists of two smaller bogs separated by a berm, totaling 10.7 acres, at an elevation of approximately 62 feet. Wetland establishment would create approximately 10.7 acres of scrub-shrub wetland at Area D. The existing berm separating the two bogs would be removed. Other existing berms around the perimeter of Area D would be left in place. Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, educational/scientific value, and threatened and endangered species habitat.

Area E consists of two smaller bogs separated by a berm, totaling 6.6 acres, at an elevation of approximately 62 feet. Excavation of the area would allow creation of approximately 6.6 acres of open water wetland. The existing berm separating the two bogs would be removed as part of the site excavation. Other existing berms around the perimeter would be left in place. Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, fish and shellfish habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, recreation, educational/scientific value, visual quality/aesthetics, and threatened and endangered species habitat.

Area F consists of a single small bog, 1.7 acres, at an elevation of between 59 and 62 feet. Emergent marsh wetland is proposed for this area. Wetland establishment would result in approximately 1.7 acres of emergent marsh wetland at Area F. Existing perimeter berms would be left in place. Functions and values provided by the newly established wetland would include groundwater recharge/discharge, floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, wildlife habitat, educational/scientific value, visual quality/aesthetics, and threatened and endangered species habitat.

Summary of Proposed Mitigation

Wetland mitigation for the South Coast Rail project is proposed to use wetland establishment, reestablishment, enhancement and preservation. Mitigation goals were established following both MassDEP regulations and guidance and USACE mitigation rules (33 CFR 332) and guidance. The mitigation goals established for state resource areas were:

- A 1:1 replacement ratio for BLSF and LUW; and
- A 2:1 replacement ratio for BVW.

The mitigation goals established for federal resource areas were:

- A 1:1 replacement ratio for permanent impacts to Open Water wetlands;

- A 2:1 replacement ratio for permanent impacts palustrine emergent and scrub-shrub wetlands;
- A 3:1 replacement ratio for permanent impacts to palustrine forested wetlands;
- A 1:1 replacement ratio for temporary impacts to palustrine emergent and scrub-shrub wetlands, to be replaced in situ; and
- A 1.5:1 replacement ratio for temporary impacts to palustrine forested wetlands, to be replaced in situ plus additional mitigation added to the mitigation goals for the loss of forested wetland cover associated with the delay in the growth of tree species.

MassDOT met with reviewing agencies of the ICG to review lists of potential sites for both wetland compensation and land preservation. Based on agency input and GIS analysis, the list of potential sites for wetland establishment was narrowed down to five sites, plus an additional two sites raised by agency members, for a total of seven sites that were advanced to a wetland compensation design concept. Wetland establishment at these sites is proposed to meet federal and state mitigation goals by providing:

- Up to 76.1 potential acres of BVW mitigation (mitigation required is 19.2 acres for the Stoughton Alternative or 16.8 acres for the Whittenton Alternative);
- Up to 7.0 potential acres of LUW mitigation (required area is 1.9 acres for permanent impacts on the Stoughton Alternative or 1.8 acres for the Whittenton Alternative); and
- Up to 13.1 potential acres of BLSF mitigation (mitigation required is 6.7 acres for the Stoughton Alternative or 4.7 acres for the Whittenton Alternative). Final design of BLSF mitigation will also assess the volume of compensatory storage provided on a foot by foot basis in comparison to the impacted BLSF.
- Wetland establishment at these sites is proposed to meet federal mitigation goals by providing:
- Up to 58.8 potential acres of palustrine forested wetlands mitigation (required area is 25.5 acres for permanent impacts on the Stoughton Alternative or 23.6 acres for the Whittenton Alternative);
- Up to 14.5 potential acres of palustrine scrub-shrub wetlands (required area is 1.8 acres for both alternatives);
- Up to 2.8 potential acres of palustrine emergent wetlands mitigation (required area is 1.8 acres for permanent impacts on either the Stoughton or Whittenton Alternatives); and
- Up to 7.0 potential acres of Open Water mitigation (required area is 1.9 acres for permanent impacts on the Stoughton Alternative or 1.8 acres for the Whittenton Alternative);

Chapter 4.14, *Biodiversity, Wildlife and Vegetation* addresses potential mitigation measures for direct and indirect impacts to vernal pools. The proposed wetland mitigation (establishment and restoration) areas could be designed to include new vernal pools to provide at least a 3:1 replacement of lost vernal

pool area (assuming the same mitigation ratio as for forested wetlands). Replacement vernal pools would be designed in accordance with the Corps' Guidelines for Vernal Pool Establishment.

Mitigation for vernal pool impacts would also be provided through preservation of vernal pool-upland complexes. Although MassDOT has not selected the final sites for wetland preservation, several of the potential preservation sites identified in the Wetland Mitigation Technical Report contain important vernal pool complexes:

- P9, Gobi Site
- P25, Rattlesnake Hill
- P26, Echo Pond
- T34B, Hockomock ACEC
- P36, Taunton River
- P52, Runnies River
- P53, Palmer River
- P56, Acidic Fen
- P58, Greenway Connection
- P59, Mattapoiset River Aquifer
- P62, BioReserve Infill

While the areas of potential mitigation are larger than the required mitigation, MassDOT would commit to constructing the amount of mitigation necessary to satisfy the required mitigation goals. At the current level of design for the project, proposed mitigation plans are not sufficiently accurate to determine the amount of wetland establishment that is practicable in a given area and will likely change when detailed field conditions are evaluated. The proposed mitigation plans cover larger areas than are required and allows for changes or reductions in the area of wetland mitigation from unknown site constraints.

Wetlands would generally be constructed by excavating wetland establishment sites to the appropriate elevation to establish a connection to groundwater hydrology. Wetland soils would be placed in the excavated areas to match the surrounding topography. Plantings would be installed at the sites to provide the appropriate vegetation cover types in the establishment sites. Sites would be monitored for a 10 year period after the completion of wetland construction to assess their development, hydrology, and functions and values.

Table 4.16-61 and Table 4.16-62 provide summaries of mitigation goals and potential mitigation totals by state and federal resource areas, respectively.

Table 4.16-61 Summary of Mitigation by State Resource Area

Site ID	Total Size	BVW (acre)	LUW (acre)	BLSF (acre)
A	5.4	5.4	-	4.9
B	6.5	6.5 [1]	-	-
C	1.7	1.7	-	1.5
D	3.5	3.5	-	3.1
E	4.3	4.3	-	3.2
F	0.4	-	0.4	0.4
G	61.3	54.7	6.6	-
Total Potential Mitigation (ac)	89.0	76.1	7.0	13.1
Required Mitigation (Stoughton)		19.2	1.9	6.7
Required Mitigation (Whittenton)		16.8	1.8	4.7

1 An additional 5.9 ac of forested upland would be created from this site.

Table 4.16-62 Summary of Mitigation by Cover Type[1] (acres)

Site ID	Total Size	OW	PEM	PSS	PFO
A	5.4	-	-	-	5.4
B	12.4	-	-	-	6.52
C	1.7	-	-	0.5	1.2
D	3.5	-	1.1	1.2	1.2
E	4.3	-	-	2.1	2.2
F	0.4	0.4	-	-	-
G	61.3	6.6	1.7	10.7	42.3
Total Potential Mitigation (ac)	89.0	7.0	2.8	14.5	58.8
Required Mitigation (Stoughton)		1.9	2.1	1.8	27.9
Required Mitigation (Whittenton)		1.8	1.2	1.8	25.7

1 Cowardin Types: OW = Open Water, PEM = Palustrine Emergent, PSS = Palustrine Scrub/Shrub PFO = Palustrine Forested.

2 An additional 5.9 ac of forested upland would be created from this site.

Both the Stoughton and Whittenton Alternatives of the South Coast Rail project would require a variance from the regulations of the WPA, an Individual Water Quality Certificate under Section 401 of the CWA, and an Individual Permit under Section 404 of the CWA. No alternative of the project that would satisfy the purpose and need of the project would avoid wetland impacts. As documented in this report, the South Coast Rail project addresses state and federal wetland regulations and meets the criteria for the required variances and permits needed to allow the proposed wetland impacts. Mitigation for those wetland impacts can be provided in compliance with the state and federal mitigation guidelines to offset the adverse impacts to wetland habitat, and functions and values of wetlands from the project.

Once a LEDPA is determined, the project would advance to a final design stage. This would require MassDOT to prepare a final set of engineering plans. This information would be used for the preparation of Notices of Intent (NOI) for each municipality along the right-of-way. Either alternative exceeds the area of alteration to BVW and would require the Commissioner of MassDEP to issue a variance from the performance standards of the WPA regulations. The procedure for requesting a variance includes first submitting the NOIs to the Conservation Commission for each municipality along the right-of-way. The

Commission in each municipality would be required to deny the proposed project in their Order of Conditions (OOC). MassDOT would then request that the MassDEP Southeast Regional Office issue a Superseding OOC (SOC) for the project. The Regional Office would be required to deny the proposed project in its SOC. MassDOT would then request that the Commissioner issue a variance.

Mitigation of Temporary Impacts

A range of measures would be implemented both during and immediately after the construction period to avoid and minimize temporary impacts to wetlands resulting from construction of the LEDPA. Potential measures that would be undertaken are described below. They include preventative measures as well as the in-kind restoration of regulated areas along the right-of-way and at bridges and culverts.

Minimization

An erosion and sedimentation control program would be implemented to minimize temporary impacts to wetland resource areas during the construction phase of the project. The program would incorporate Best Management Practices (BMPs) specified in guidelines developed by MA DEP and the USEPA through the development of a stormwater pollution prevention plan (SWPPP).

Proper implementation of the erosion and sedimentation control program would:

- Minimize exposed soil areas through sequencing and temporary stabilization
- Place structures to manage stormwater runoff and erosion; and
- Establish a permanent vegetative cover or other forms of stabilization as soon as practicable.

There are several structural and non-structural devices that would be implemented during the construction phase of the project to limit sediment movement, and to protect adjacent wetland resources from temporary impacts. An erosion control barrier would be installed upgradient of wetland resource areas and may consist of a barrier of hay bales and silt fence. Additional practices may include stabilized construction exits, catch basin inlet protection such as silt sacks, and dewatering filters if dewatering is required.

Mitigation of temporary construction-related impacts by erosion and sedimentation control may also include: temporary seeding, hay bale checkdams, and rock outlet protection. These BMPs aid in the reduction of erosion by stabilizing exposed soil surfaces and reducing flow velocities.

Restoration

Mitigation for construction period impacts would include in-kind and *in situ* replacement of resource areas. This restoration consists of several components, including regrading disturbed areas, replanting appropriate wetland vegetation, removing construction materials from the project area, and implementing an invasive species control plan.

Following the conclusion of construction, all temporarily impacted areas would be regraded and restored to match the adjacent wetland elevation. In locations where the placement of fill or other earthwork had occurred, stockpiled hydric topsoil or equivalent manufactured topsoil would be placed in the upper 12 inches of the soil profile. Planting plans for restoration areas would specify plant

materials appropriate to the type of wetland impacted in that location. As part of these planting plans, locations may also be seeded with an appropriate wetland seed mixture in order to provide rapid vegetative coverage to stabilize disturbed soils.

All debris would be removed from the work area. Hay bales used for sedimentation and erosion control would be broken up and spread as mulch in adjacent upland areas where possible, or would be removed from work area and disposed of properly outside of the project area.

An invasive species control plan would be implemented to prevent disturbed areas from becoming colonized by invasive species such as common reed. The invasive species control plan should include frequent eradication of invasive species during the initial period following construction to prevent the establishment of large populations that could spread to adjacent undisturbed areas.

Upon completion of work, temporarily impacted upland areas adjacent to wetland restoration areas would be regraded. Areas of exposed soils would be seeded with a wildlife/conservation grass mixture to provide permanent stabilization and erosion control. The seeded slopes would be temporarily mulched with loose hay to prevent erosion before the seeds germinate and take root.

4.16.11 Regulatory Compliance of the Alternatives

Proposed work and its associated impacts would be subject to regulatory review with respect to state and federal wetlands regulatory programs, as described below.

4.16.11.1 Massachusetts Wetlands Protection Act (WPA)

The Massachusetts Wetlands Protection Act (WPA) regulations (310 CMR 10.00) establish specific mitigation requirements for the majority of wetland resource areas. Performance standards are outlined for work performed in each of the wetland resources regulated under the Massachusetts State Wetlands Regulations. The following sections list these performance standards by resource type except for Land Subject to Coastal Storm Flowage (LSCSF) for which there are no performance standards.

The South Coast Rail project cannot fully comply with the performance standards of the WPA, and will require a variance under 310 CMR 10.05(10) (a). This regulation allows performance standards to be waived in the event that: “mitigating measures are proposed that will allow the project to be conditioned so as to contribute to the protection of the interests identified in M.G.L. c. 131 §40.” The regulation also requires that “there are no reasonable conditions or alternatives that would allow the project to proceed in compliance” with the regulations of the Act, and that “the variance is necessary to accommodate an overriding community, regional, state or national public interest.” MassDOT has prepared data in the Technical Reports for the FEIS/FEIR intended to demonstrate that the conditions for granting a waiver have been met. However, MADEP is the final arbiter as to whether MassDOT has met the necessary regulatory requirements for a variance. MassDOT will attempt to design mitigation for the project that complies with the resource area standards to the maximum extent practicable.

This section discusses the project’s compliance with the performance standards established for each resource area and the need for a variance to proceed with the project.

Performance Standards

Performance standards are outlined for work performed in each of the wetland resources regulated under the Massachusetts State Wetlands Regulations.[43] The following sections list these performance standards by resource type except for Land Subject to Coastal Storm Flowage for which there are no performance standards.

Bank

The regulations for Bank (310 CMR 10.54(4)) do not specify mitigation requirements, but do list general performance standards that require that work on a Bank not impair any of the following:

(a) The physical stability of the Bank;

(b) The water carrying capacity of the existing channel within the Bank;

(c) Ground water and surface water quality;

(d) The capacity of the Bank to provide breeding habitat, escape and food cover for fisheries; and

(e) The capacity of the Bank to provide important wildlife habitat functions.

Where Bank is significant to important wildlife habitat functions, the regulations at 310 CMR 10.60(3) apply. These regulations require that alterations of wildlife habitat characteristics beyond permissible thresholds (for Bank, 50 linear feet) be restored onsite or replicated offsite in accordance with the following general conditions:

(a) The surface of the replacement area to be created shall be equal to that of the area that will be lost;

(b) The elevation of groundwater relative to the surface of the replacement area shall be approximately equal to that of the lost area;

(c) The replacement area shall be located within the same general area as the lost area. In the case of banks and land under water, the replacement area shall be located on the same water body or waterway if the latter has not been rechanneled or otherwise relocated. In the case of bordering land subject to flooding, the replacement area shall be located approximately the same distance from the water body or waterway as the lost area. In the case of vernal pool habitat, the replacement area shall be located in close proximity to the lost area;

(d) Interspersion and diversity of vegetation, water and other wildlife habitat characteristics of the replacement area, as well as its location relative to neighboring wildlife habitats, shall be similar to that of the lost areas, insofar as necessary to maintain the wildlife habitat functions of the lost area;

[43] 310 Code of Massachusetts Regulations (CMR) 10.00. Revised June 2009

(e) The project shall not alter ten or more acres of Land Subject to Flooding (LSF) or Land Under Water (LUW) found to be significant to the protection of wildlife habitat, or 2,000 feet or more of Bank found to be significant to the protection of wildlife habitat (in the case of a bank of a stream or river, this shall be measured as each side of said stream or river);

(f) If the replacement area is located in an area subject to M.G.L. c. 131 §40, there shall be no adverse effect on the existing important wildlife habitat functions of said area as measured by the standards of 310 CMR 10.60;

(g) The "thresholds" established in 310 CMR 10.54(4)(a)(5)m, 10.56(4)(a)4, 10.57(4)(a)3, and 10.58(4)(d)1.c (below which alterations of resource areas are not deemed to impair capacity to provide important wildlife habitat functions) shall not apply to any replacement area; and

(h) The replacement area shall be provided in a manner which is consistent with all other General Performance Standards for each resource area in 310 CMR 10.51 through 10.60.

Bordering Vegetated Wetlands (BVW)

For work proposed within BVW, the following performance standards apply:

- Any proposed work in a BVW shall not destroy or impair any portion of the said area;
- The issuing authority may issue an Order of Conditions permitting work, which results in the loss of up to 5,000 square feet of BVW when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area would function in a manner similar to the area that would be lost;
- No project may be permitted that would have any adverse effect on the specified habitat sites of rare vertebrate or invertebrate species; and
- Any proposed work shall not destroy or otherwise impair any portion of a BVW that is within an ACEC designated by the Secretary of Environmental Affairs.

The regulations at 310 CMR 10.55(4)(b) establish seven general performance standards for replacement of lost BVW. Although the South Coast Rail project does not comply with the performance standard limiting BVW loss to 5,000 square feet and will therefore require a variance, the subsequent performance standards are applicable.

- The issuing authority may issue an Order of Conditions permitting work, which results in the loss of up to 5,000 square feet of BVW when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area would function in a manner similar to the area that would be lost;
- The surface of the replacement area to be created shall be equal to that of the area that will be lost (the MassDEP has determined that projects requiring a variance should provide replacement wetland area at a 2:1 ratio);

- The elevation of groundwater relative to the surface of the replacement area shall be approximately equal to that of the lost area;
- The overall horizontal configuration and location of the replacement area with respect to the bank shall be similar to that of the lost area;
- The replacement area shall have an unrestricted hydraulic connection to the same water body or waterway associated with the lost area;
- The replacement area shall be located within the same general area of the water body or reach of the waterway as the lost area;
- At least 75 percent of the surface of the replacement area shall be reestablished with indigenous wetland plant species within two growing seasons, and prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard U.S. Soil Conservation Service methods; and
- The replacement area shall be provided in a manner that is consistent with all other General Performance Standards for each resource area in Part III of 310 CMR 10.00.

Land Under Waterbodies and Waterways (LUWW)

The regulations for Land Under Water Bodies and Waterways (LUWW) (310 CMR 10.56(4)) do not specify mitigation requirements, but do list general performance standards, which require that work within LUWW not impair any of the following:

(a) The water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks;

(b) Ground and surface water quality;

(c) The capacity of said land to provide breeding habitat, escape cover and food for fisheries; and

(d) The capacity of said land to provide important wildlife habitat functions.

Where LUWW is significant to important wildlife habitat functions, the regulatory standards at 310 CMR 10.60(3) apply. These regulations require that alterations of wildlife habitat characteristics beyond permissible thresholds (for LUWW, 5,000 square feet) be restored onsite or replicated offsite in accordance with the general conditions listed above for Bank.

Bordering Land Subject to Flooding (BLSF)

For work proposed in BLSF, the following performance standards apply:

- Compensatory flood storage shall be provided for all flood storage volume that would be lost as the result of a proposed project within BLSF. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or waterbody. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of the river, stream or creek;

- Work within BLSF, including that work required to provide the compensatory flood storage specified above, shall not restrict flows so as to cause an increase in flood stage or velocity; and

Work in those portions of bordering land subject to flooding found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important wildlife habitat functions. Where this resource is significant to important wildlife habitat functions, the regulatory standards at 310 CMR 10.60(3) apply. These regulations require that alterations of wildlife habitat characteristics beyond permissible thresholds (for BLSF, 5,000 square feet) be restored onsite or replicated offsite in accordance with the general conditions listed above for Bank.

Riverfront Area

The performance standards for Riverfront Area (310 CMR 10.58(4)) do not specify mitigation requirements. However, where this resource is significant to important wildlife habitat functions, the regulatory standards at 310 CMR 10.60(3) apply. These regulations require that alterations of wildlife habitat characteristics beyond permissible thresholds (for Riverfront Area, 5,000 square feet) be restored onsite or replicated offsite in accordance with the six general conditions listed above for Bank.

Coastal Bank

There are no specific mitigation requirements for work on Coastal Bank. The regulations at 310 CMR 10.30(6) require that any project on a coastal bank shall have no adverse effects on the stability of the coastal bank. Compliance with this performance standard would require that alterations of Coastal Bank be mitigated on-site through measures to ensure stability.

Build Alternatives

None of the Build Alternatives would meet all of the performance standards outlined for each resource protected under the Act. Construction of any of the Build Alternatives would therefore require the Commissioner of MA DEP to issue a variance from the WPA regulations.

Bank

Each of the proposed alternatives would alter Bank for reconstruction and rehabilitation of the rail bed and bridges. Generally, the altered bank is directly adjacent to the rail bed at a bridge or culvert associated with a stream crossing. The replacement or extension of culverts and bridge abutments would be designed and constructed in such a way as to maintain physical stability of the bank, and water carrying capacity. Construction would be done using appropriate erosion and sedimentation control measures to protect water quality.

Alterations of bank at existing bridges or culverts would be temporary in nature, except in locations where additional tracks are added. In most cases, existing bridge abutments or culverts provide minimal important wildlife habitat. All areas of temporarily altered bank would be restored in-kind.

At locations where culvert extensions or enlarged bridge abutments would be required, wildlife habitat evaluations would be performed to determine the capacity of the bank to provide wildlife habitat functions. Bridges and culverts would be designed to maintain the physical stability and water carrying capacity of the channel. The wetland habitat evaluations would be used to guide mitigation efforts to restore lost habitat functions within the project area. Where necessary, permanently altered bank could

be relocated and reconstructed as mitigation to meet the performance standards (unless impacts occur within rare species habitat). Detailed designs for bank replacement would be developed in a later design phase, once the LEDPA is determined. This would be done in consultation with MA DEP and the local Conservation Commissions.

Bordering Vegetated Wetlands

Each of the proposed alternatives would result in the loss of over 5,000 square feet of BVW and would result in the loss of BVW within endangered and protected species habitat. There would be loss of BVW in an ACEC along the Stoughton and Whittenton Alternatives. These losses do not conform to the WPA performance standards and would require a Variance from the Commissioner of DEP.

Land Under Waterbodies and Waterways (LUWW)

Specific impacts to LUWW would be calculated in the final design phase for the LEDPA. It is expected that impacts would be minor and associated with the replacement of bridges and culverts. All impacts would be mitigated for and proposed work would not alter the carrying capacity of the channel, the water quality, or wildlife habitat. Each of the Alternatives can be constructed in conformance with the performance standards and would not require a Variance from the Commissioner of MA DEP for work occurring in LUWW (unless the impacts occur within rare species habitat).

Bordering Land Subject to Flooding (BLSF)

Each of the proposed Alternatives would result in losses to BLSF and losses within areas of protected habitat for Rare or Protected species. This does not conform to the performance standards outlined in the Act and work along any of the proposed Alternatives would require a Variance from the Commissioner of MA DEP for work proposed within BLSF.

Riverfront Area

Work within Riverfront Area is unavoidable along each of the proposed alternatives due to the location of the rights-of-way and the number of perennial streams that each crosses. Although primarily redevelopment, portions of work proposed within Riverfront Area would occur within habitat of protected or rare species and would not conform to the performance standards. A Variance from the Commissioner of MA DEP would be required for work along any of the proposed alternatives if the performance standards could not be met. During a subsequent design phase, the project's ability to comply with the compensatory storage performance standard and wildlife habitat performance standard would be evaluated to determine if a variance is required.

Coastal Bank

The Fall River Secondary is the only proposed alternative that would impact Coastal Bank. Work in these areas consists of reconstruction and would meet all the performance standards outlined in the Act. A variance would not be required for work within Coastal Bank.

4.16.11.2 Water Quality Certification – Section 401

Section 401 of the Federal Clean Water Act requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates or would originate that the

discharge will comply with the applicable (i.e., Commonwealth of Massachusetts) water quality standards. MA DEP executes its responsibilities pursuant to Section 401 under the Massachusetts Clean Water Act (M.G.L. c 21 §§ 26-53) and is the final arbiter as to whether a water quality certification will be issued, denied, or waived. The Order of Conditions issued by local conservation commissions automatically assumes the issuance of a water quality certificate for projects impacting less than 5,000 square feet of wetlands. This project would require MassDOT to obtain an Individual Water Quality Certificate from MA DEP as impacts would exceed 5,000 square feet.

There are seven criteria for the evaluation of applications for discharge of dredge or fill material (314 CMR 9.06):

- No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem;
- No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that would minimize potential adverse impacts to the bordering or isolated vegetated wetlands or land under water, including a minimum of 1:1 restoration or replication of isolated or bordering wetlands;
- No discharge of dredged or fill material shall be permitted to ORWs, except for the activities specified in 314 CMR 9.06(3)(a) through (I), which remain subject to an alternatives analysis and other requirements of 314 CMR 9.06;
- Discharge of dredged or fill material to an ORW specifically identified in 314 CMR 4.06(1)(d) (e.g., vernal pool, within 400 feet of a water supply reservoir and any other area so designated) is prohibited as provided therein unless a variance is obtained under 314 CMR 9.08;
- No discharge of dredged or fill material is permitted for the impoundment or detention of stormwater for the purposes of controlling sedimentation or other pollutant attenuation;
- Stormwater discharges shall be provided with BMPs to attenuate pollutants and provide a set back from receiving water or wetland; and
- No discharge of dredged or fill material shall be permitted in the rare circumstances where the activity meets the criteria for evaluation but would result in substantial adverse impacts to the physical, chemical, or biological integrity of surface waters of the Commonwealth.

One of the seven criteria for the evaluation of applications for discharge of dredge or fill material (314 CMR 9.06(2)) is relevant to mitigation:

- No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that would minimize potential adverse impacts to the bordering or isolated vegetated wetlands or land under water, including a minimum of 1:1 restoration or replication of isolated or bordering wetlands.

No-Build Alternative

The No-Build Alternative requires no construction and would not result in any impacts to wetland resources areas. A water quality certificate would not be required for this alternative.

Stoughton Alternatives

The Stoughton Alternatives comply with the criteria outlined for the discharge of dredged or fill material within waterways. Compliance with the criteria outlined in 310 CMR 9.06 is explained below. Based on the methodology used for delineating the boundaries of vernal pools, the Stoughton Alternatives would require fill in ORWs (based on the presence of one or more vernal pools) and would not meet performance standards for the discharge of dredged or fill material in ORWs.

No dredging or fill is planned in conjunction with the construction of stormwater management systems proposed as part of this project, and the proposed stormwater systems proposed at station sites and layover facilities include BMPs and setbacks as outlined in the Stormwater Management Regulations.

Whittenton Alternatives

The Whittenton Alternatives comply with the criteria outlined for the discharge of dredged or fill material within waterways. Compliance with the criteria outlined in 310 CMR 9.06 is explained below.

Based upon the methodology used for delineating the boundaries of vernal pools, the Whittenton Alternatives would require fill in ORWs (based on the presence of one or more vernal pools) and would not meet performance standards for the discharge of dredged or fill material in ORWs.

No dredging or fill is planned in conjunction with the construction of stormwater management systems proposed as part of this project, and the proposed stormwater systems proposed at station sites and layover facilities include BMPs and setbacks as outlined in the Stormwater Management Regulations.

4.16.11.3 Section 404 of the Clean Water Act

Section 404 of the Clean Water Act requires a Department of the Army permit for the discharge of dredged or fill material into waters of the United States, including adjacent wetlands. The Build Alternatives would require the issuance of an Individual Section 404 Permit (i.e., would not be eligible for the Massachusetts Programmatic General Permit) because they would result in the loss of more than one acre of vegetated wetland, as described in the preceding analyses.

The Build Alternatives would require a Section 404 permit for the placement of fill in freshwater wetlands. The wetland filling is evaluated, in part, using the US EPA Guidelines for Specification of Disposal Sites for Dredged or Fill Material promulgated pursuant to Section 404(b) (1) of the Clean Water Act (Section 404(b)(1) Guidelines) and its implementing regulations at 40 CFR 230 *et seq*. The Guidelines are intended to avoid unnecessary filling of waters and wetlands. Two of the guidelines are relevant to mitigation:

- No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences; and

- No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that will minimize adverse effects of the discharge on the aquatic ecosystem.

In setting mitigation requirements for Section 404 permits, the USACE considers watershed needs, mix of habitat types, and compatibility with adjacent land use.

The USACE issued rules for compensatory wetland mitigation (33 CFR Parts 325 and 332) in April 2008. This guidance emphasizes a watershed approach to selecting compensatory mitigation measures and locations. Five types of compensatory mitigation are recognized:

- Establishment (creation), defined as: "the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area and functions."

- Re-establishment: "the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions." In the past, this was generally referred to as "restoration."

- Rehabilitation: "the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area."

- Enhancement: "the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area."

- Preservation: "the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions."

The New England District has published a guidance[44] document for compensatory mitigation that establishes certain mitigation ratios for permanent impacts. For purposes of calculating federal mitigation goals, it is assumed that the wetland restoration standard would be applied. Using this formula assuming that wetland restoration would be required for permanent impacts, a 1:1 minimum ratio is required for impacts to areas of open water, a 2:1 minimum ratio is required for permanent to

[44] USACE. 2010. New England District Compensatory Mitigation Guidance. New England District, U.S. Army Corps of Engineers, July 20, 2010. Available online at: <http://www.nae.usace.army.mil/Portals/74/docs/regulatory/Mitigation/CompensatoryMitigationGuidance.pdf> (April 26, 2013).

emergent wetlands, a 2:1 minimum ratio is required for impacts to scrub shrub wetlands, and a 3:1 minimum ratio is required for impacts to forested wetlands. Temporary impacts are also addressed in the guidance document, with most impacts requiring the replacement of a given percentage of the impacted area. Meetings between MassDOT and reviewing agencies, described in more detail in Chapter 5, agreed upon replacement ratios of 1:1 for temporary impacts to either emergent wetlands or scrub-shrub wetlands, to be replaced in-situ, and 1.5:1 for temporary impacts to forested wetlands, to be replaced in-situ as well as offsite.

The regulations recognize that mitigation may be located on site (at or adjacent to the impact site) or off site (at another location in the same watershed). Wetland mitigation banks, where available, and in lieu fee programs, where available, may also be used to mitigate for unavoidable impacts. Neither of these programs currently exists in Massachusetts. However, the USACE recently (October 2, 2012) issued a public notice seeking comments on a "Prospectus for a State-Wide In-Lieu Fee Program Administered by the Massachusetts Department of Fish and Game." The In-Lieu Fee (ILF) program would allow all applicants for Section 404 permits to pay into a trust fund administered by the Department of Fish and Game (DFG), who would then propose compensatory mitigation projects. The USACE would determine which projects were eligible to be used in the ILF program. Permittees would purchase mitigation credits, based on a ratio to be determined. If this program is implemented, it may impact the mitigation strategy for the project. MassDOT would consult with the USACE and review agencies to examine this option should it arise.

These regulations also recognize that compensatory mitigation must be commensurate with the amount and type of impact, and requires that the Corps determine what is practicable and capable of compensating for the aquatic resource function that would be lost, and what is environmentally preferable. Considerations include:

- The likelihood for ecological success;
- The location relative to the impact site;
- The significance within the watershed; and
- The costs of the compensatory mitigation project.

These regulations require a watershed-based approach, ideally based on an existing watershed plan that provides information on the land uses, natural habitats, water quality, and aquatic resources within a watershed. The goal of using a watershed approach is to maintain and improve the quality and quantity of aquatic resources within a watershed, by strategically siting compensatory mitigation sites.

Practicable Alternatives

Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.[45] In considering whether an alternative is practicable, due consideration must be given to cost, constructability, existing technology and also to logistical considerations such as traffic flow and safety in and around each particular alignment and station location. The practicability of the alternatives is considered in the Corps' determination of the

[45] 40 CFR 230.3(q)

LEDPA. Once a LEDPA is determined, the project would advance to a final design stage. This would require MassDOT to prepare a final set of engineering plans.

Water Quality/Threatened and Endangered Species

The Build Alternatives include proposed stormwater management systems intended to mitigate potential impacts to water quality by controlling runoff velocities and removing pollutants from the stormwater runoff discharging from station locations to downstream surface water resources. The proposed project has been designed to comply with Massachusetts Stormwater Standards.[46] Due to the proposed impacts to ORWs, the Build Alternatives would require a variance from the state water quality standards (Section 401).

The Build Alternatives would seemingly not affect any federally-listed endangered species, because there are none within the immediate project area. Habitat for several state listed species occurs within or immediately adjacent to the right-of-way. This is described in detail in Chapter 4.14, *Biodiversity. Wildlife and Vegetation* and Chapter 4.15, *Threatened and Endangered Species*.

No Significant Degradation

The 404(b)(1) Guidelines stipulate that no discharge of dredged or fill material shall be permitted that will cause or contribute to significant degradation of the waters of the United States.[47] Measures to protect and avoid impacts to wetlands and water resources were incorporated into the design process of the Build Alternatives and will be further refined for the LEDPA. Construction practices will be implemented in accordance with state and federal guidelines to prevent unnecessary impacts to wetland and water resources. Water resources are further described in Chapter 4.17, *Water Resources*.

Reasonable Steps to Minimize Adverse Effects

The 404(b)(1) Guidelines further stipulate that no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem, To the extent practicable, adverse effects to wetland resources will be minimized through avoidance, minimization, and compensatory mitigation.

Avoidance

Avoidance of all direct wetland impacts would only be possible by implementing the No-Build Alternative. Section 4.16.10.1 of this chapter describes specific measures incorporated into the design process to incorporate avoidance of impacts into each of the Build Alternatives.

Minimization

Special construction techniques, such as retaining walls, have been incorporated into the design of the Build Alternatives to further minimize adverse impacts to wetlands. A full description of the measures taken to minimize wetland impacts is provided above in Section 4.16.10.1.

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[46] 310 Code of Massachusetts Regulations (CMR) 10.05(6) (k).
[47] 40 CFR 230.10(c)

Mitigation

Mitigation would be provided to offset all losses of wetland and other aquatic resource functions and values. Section 4.16.10 identifies the methodology that would be used to identify locations and presents the mitigation goals that would provide replacement of lost areas as well as functions and values. Mitigation areas would be designated within the same watershed as the lost area whenever possible. Once the LEDPA is determined, specific mitigation sites would be identified and conceptual mitigation designs prepared.

4.17 WATER RESOURCES

4.17.1 Introduction

This chapter discusses the existing water resources within and adjacent to the South Coast Rail project corridors and potential impacts to water resources and water supply protection areas within the study area. This section provides background information on the South Coast Rail project as well as general information on water resources regulations. Section 4.17.2 identifies water resources in the project study area and defines the regulatory categories for water resources and the specific water resources in proximity to each of the alternatives. Section 4.17.3 describes potential impacts and mitigation associated with the alternatives under consideration.

4.17.1.1 Resource Definition

Surface and groundwater are important natural resources that have a variety of uses including public drinking water, irrigation, industrial, and wildlife habitat. Water quality is determined by the amount of dissolved or suspended material that the water may contain. The quality of surface water and groundwater is influenced by surficial geology, land use, and water quality of source waters. The use of water may be limited by its physical and chemical characteristics. Changes in temperature, pH, dissolved oxygen (DO) content, and pollutant concentrations may make surface waters or groundwater unsuitable for their existing uses.

The quality of a surface waterbody is largely determined by the terrain and condition of its contributing watershed. Pollutant sources can include point sources, such as municipal wastewater treatment plants and industrial discharges, with varying concentrations of particles and/or chemicals, as well as non-point sources, such as stormwater runoff, from farmland, containing sediment, fertilizer and pesticides.

Groundwater quality may also be affected by aboveground pollutant sources. Precipitation that infiltrates through the soil to the water table may carry pollutants encountered on the surface or in the soil. However, aquifers are often buffered from surface influences by underground hydrogeologic features, such as different soil types. Layers of clay may impede infiltration, preventing water from reaching the aquifer, while layers of sand may filter out many contaminants as the water travels through the soil. Drinking water wells are often located in highly-permeable soils to maximize potential pumping rates. These same soils can allow accidental spills to reach the well quickly, especially if the spills are close to the well itself. Therefore, protection of groundwater supplies must consider potential pollutant sources, well locations, and soil conditions.

The information presented in the following sections describes the surface and groundwater resources located adjacent to the alignments of the alternatives under consideration. Resources assessed include named surface waters such as rivers and lakes as well as public drinking water wells. Information on the existing quality and usage of these resources is based on publicly accessible information, including the *Massachusetts Integrated List of Waters*.[1]

[1] Massachusetts Department of Environmental Protection, Division of Watershed Management. *Massachusetts Year 2006 Integrated List of Waters*. October 2007.

4.17.1.2 Regulatory Context and Significance

Surface and groundwater resources are protected under several state and federal regulatory programs, including the federal Clean Water Act (Sections 402 and 404) and the Massachusetts Clean Waters Act (MGL Chapter 21, §26-53). Other applicable regulations include the Massachusetts Section 401 Discharge regulations (314 CMR 9.00), Groundwater Quality Standards (314 CMR 6.00), and Surface Water Quality Standards (314 CMR 4.00). Some waterways are also regulated under MGL Chapter 91, which protects the public interest in tidelands, Great Ponds, and non-tidal rivers.

Clean Water Act of 1977

Water quality must be addressed for compliance with the Federal Water Pollution Control Act, also known as the Clean Water Act, which provides the authority to the USEPA to establish water quality standards (or to states to establish standards equal to or more stringent than USEPA standards), to control discharges into surface and subsurface waters, to develop waste treatment management plans and practices. It requires states to monitor and classify waterbodies, establish goals, and publish lists of monitoring and classification results. The Clean Water Act gives states the authority and responsibility to publish water quality standards.[2]

Section 303(d) of the Clean Water Act

Section 303(d) of the Clean Water Act also establishes the Total Maximum Daily Load (TMDL) program. A TMDL is the allowable load of a single pollutant from all point and non-point sources to a waterbody. Under the TMDL program, states establish priority rankings for their waterbodies and identify the uses for these waterbodies (e.g., drinking water supply, recreation, etc.). TMDLs can then be set for individual pollutants to ensure that the quality is adequate for the designated uses. The USEPA must approve or disapprove any TMDL established by the state. If the USEPA disapproves a TMDL, it must set the TMDL itself.

If a project impacts a TMDL-listed waterbody, appropriate measures must be taken to control the discharge of the listed pollutant and meet the TMDL requirements. Some TMDLs may require additional measures (including stormwater treatment) in order to prevent an increase in pollutant loading to the receiving water.

Section 404 of the Clean Water Act

Section 404 of the Clean Water Act requires a Department of the Army permit (administered by the U.S. Army Corps of Engineers) for the discharge of dredged or fill material into waters of the United States, including adjacent wetlands. Any of the South Coast Rail Build Alternatives under consideration would require the issuance of an Individual Section 404 Permit (i.e., would not be eligible for the Corps' Massachusetts General Permit) if it results in the loss of more than 1 acre of waters of the United States.

The alternatives would require a Section 404 permit for the placement of fill in wetlands. The wetland filling is evaluated by the Corps using the U.S. Environmental Protection Agency Guidelines for Specification of Disposal Sites for Dredged or Fill Material (Section 404(b)(1) Guidelines). The Section 404(b) (1) guidelines are designed to avoid unnecessary filling of waters and wetlands.

[2] U.S. Code. Title 33, Chapter 26 – *Water Pollution Prevention and Control*. (November 27, 2002).

The Section 404(b)(1) Guidelines stipulate (in part) that:

- No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences;
- No discharge of dredged or fill material shall be permitted if it: (1) causes or contributes to violations of any applicable State water quality standard; (2) violates any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act; (3) Jeopardizes the continued existence of species listed as threatened or endangered under the Endangered Species Act; or (4) Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under the Marine Protection, Research and Sanctuaries Act of 1972.
- No discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States.
- No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize adverse effects of the discharge on the aquatic ecosystem

Safe Drinking Water Act

The Safe Drinking Water Act authorizes the USEPA to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water.[3] If the project impacts a drinking water supply, appropriate mitigation measures must be provided to maintain compliance with the Safe Drinking Water Act.

USEPA NPDES Construction Permit

All South Coast Rail Build Alternatives would require a National Pollutant Discharge Elimination System (NPDES) Construction Permit pursuant to Section 402 of the Clean Water Act, which regulates erosion control, pollution prevention, and other stormwater management issues at construction sites over 1 acre. This permit would include a Stormwater Pollution Prevention Plan (SWPPP) that would specify proper stormwater management procedures for any disturbed areas.

Water Quality Certificate

Section 401 of the Clean Water Act (33 U.S.C. 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the state in which the discharge originates or would originate, that the discharge will comply with the applicable effluent limitations and water quality standards.[4] In addition, the MassDEP is required to issue Water Quality Certifications for projects that result in discharge of fill to a wetland or waterbody, pursuant to the Massachusetts Clean Waters Act (MGL Ch. 21 § 26-53). This project will require issuance of an individual Water Quality Certification if it results in the loss of more

[3] U.S. Code. Title 42, Chapter 6A, Subchapter XII – *Safety of Public Water Systems*. (January 6, 2003).
[4] 33 CFR 320.3(a)

than 5,000 square feet of wetlands subject to federal jurisdiction or places fill in Outstanding Resource Water (ORW).

Massachusetts Stormwater Management Standards and Regulations

The Build Alternatives would require work within Wetland Resource Areas and buffer zones as defined and regulated under the Massachusetts WPA. Projects that fall under the jurisdiction of the WPA must comply with the Massachusetts Stormwater Management Standards included in the WPA regulations (310 CMR 10). The Stormwater Management Standards define the requirements for proper stormwater management for new or re-development sites in the State of Massachusetts. The water quality issues addressed by the standards include erosion control, peak discharge rates, groundwater recharge, total suspended solids (TSS) removal, wellhead protection, construction management, long-term maintenance, and illicit (non-stormwater) discharges to the stormwater management system. Additional stormwater regulations (310 CMR 21) have been proposed by MassDEP that apply treatment requirements to projects in TMDL areas, impose restrictions on discharges to water supply protection areas, and require infiltration to offset the effects of impervious surfaces on runoff and groundwater recharge.

Chapter 91 Waterways License

The Massachusetts Public Waterfront Act (MGL Chapter 91) gives MassDEP jurisdiction over dredging, filling, construction, demolition, and changes in use within flowed tidelands, filled tidelands, Great Ponds (ponds covering over 10 acres in their natural states), and any non-tidal navigable streams on which public funds have been expended. The proposed project may require a Waterways License due to the construction of new or modified crossings over navigable streams.

National Wild and Scenic Rivers Act

The National Wild and Scenic Rivers Act (Public Law 90-542; 16 U.S.C. 1271 et seq.) was established to preserve the free-flowing conditions of rivers with outstanding natural, cultural, and recreational values. Designation of an entire river system, or segments of, is approved by Congress or the Secretary of the Interior. Rivers are then classified as Wild: free of impoundments, generally inaccessible (except by trail), with primitive watersheds/shorelines unpolluted waters; Scenic: free of impoundments, largely undeveloped watersheds/shorelines and accessible in places by roads; or Recreational: readily accessible by road or railroad with some development along their shorelines and some past impoundments or diversions. The administration of designated rivers is assigned to a federal or state agency.

The Taunton River was designated as a Wild and Scenic River on March 30, 2009; therefore, the Build Alternatives are subject to the Wild and Scenic Rivers Act provisions. The administration of this designation occurs through a partnership between the National Park Service and the Taunton River Stewardship Council. The entire river system was included in this designation from its headwaters at the confluence of the Town and Matfield rivers in Bridgewater downstream 40 miles to the confluence with the Quequechan River at the Interstate 195 Bridge in Fall River. Twenty-six miles of the Taunton River were classified as Scenic and 14 miles as Recreational.

The Act prohibits federal support for actions such as the construction of dams or other in stream activities that would harm the river's free-flowing condition, water quality, or Outstanding Resource Values (scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values).[5] However, it does not prohibit development near designated rivers; rather it encourages regional river management practices to protect the use and enjoyment of these rivers. New development on federal lands must be guided by land use and resource management objectives that are compatible with the river's classification.

4.17.2 Existing Conditions

This section describes the existing conditions of surface water resources and public water supply wells that could be affected by the South Coast Rail project alternatives presented in the FEIS/FEIR and identifies the specific resources that could be affected under these alternatives. Figure 4.17-1 shows the project area and major waterbodies. Figure 1.4-1 illustrates the alternative alignments and proposed station locations, in relation to these waterbodies.

4.17.2.1 Regional Overview

This section summarizes the relevant local water resources and explains regulatory classifications for surface and groundwater protection.

Surface Water Resources

A screening for surface water resources was performed to identify all waterbodies that would be crossed by or within 100 feet of the centerlines of the alternatives under consideration. This process used geographic information systems (GIS) data developed by the U.S. Geological Survey (USGS) and provided by MassGIS to identify named and unnamed waterbodies. Since this screening is based only on the conceptual routes taken by the alternatives, further analysis will be necessary to determine if the construction and operation of the alternatives result in any actual impacts to these waterbodies.

The screening process identified numerous named rivers, streams, and ponds as well as unnamed, minor waterbodies. The named waterbodies are listed in Table 4.17-1.

In Massachusetts, certain surface waters with exceptional socioeconomic, recreational, ecological, or aesthetic values are designated ORWs, which require additional protection. ORWs can include drinking water supplies as well as high-value wetlands areas (specified in 314 CMR 4.06[2]) such as ACECs. The Hockomock Swamp ACEC and its associated wetlands and water bodies are described by the Massachusetts DCR as the largest vegetated freshwater wetland system in Massachusetts. The only Hockomock Swamp ACEC waterbody that would be affected by the project is Black Brook in Easton (included in Table 4.17-1). The East Branch of the Neponset River flows into the Fowl Meadow and Ponkapoag Bog ACEC and may be affected by the project. The Three Mile River ACEC is also located within the project area as presented in the DEIS/DEIR but is no longer affected by stormwater discharges from project elements. Further information regarding ACECs can be found in Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*. Information regarding wetland resources within these ACECs, and potential impacts from the project, can be found in the Chapter 4.16, *Wetlands*.

[5] National Wild and Scenic Rivers webpage: http://www.rivers.gov/.

Table 4.17-1 Named Waterbodies Adjacent to or Crossed by Project Alternatives[1]

Waterbody	
Assawompset Pond	Pierce Brook
Cedar Swamp River	Pine Swamp Brook
Beaver Meadow Brook	Prospect Hill Pond
Black Brook	Pocksha Pond
Cedar Swamp River	Quequechan River
Cotley River	Queset Brook
Fall Brook	Rattlesnake Brook
Forge Pond (Canton)	Steep Brook
Long Pond	Taunton River
Mill River	Whitman Brook
New Bedford Inner Harbor	Terry Brook
Forge Pond (Freetown)	Assonet River

1 Waterbodies within 100 feet of the centerline of an alternative are considered adjacent.

The list of waterbodies in Table 4.17-1 includes two ORWs pursuant to the *Massachusetts Surface Water Quality Standards* (314 CMR 4.04): Black Brook (Easton), and Fall Brook (Freetown). Details on the existing quality and regulatory status of the waterbodies identified are provided in Section 4.17.2, *Existing Conditions*.

The Massachusetts Water Quality Standards (314 CMR 4.00) assign class designations to inland and coastal waters. These classes specify water quality standards based on the intended uses of the waterbodies. The standards for each class can address characteristics such as temperature, dissolved oxygen (DO), pH, bacteria, solids, color and turbidity, oil and grease, and taste and odor. The classes for inland waters are:

- Class A waters are designated as sources of public drinking water supply, as excellent fish and wildlife habitat, and for primary and secondary contact recreational activities. The standards for contact recreation must be met for Class A waters even if these activities are not permitted (e.g., in a reservoir). Class A waters also have excellent aesthetic value. This is the most stringent inland water classification and includes strict standards for bacteria, DO, and other characteristics to protect the designated uses of the water and human health.

- Class B waters are designated for primary and secondary contact recreational activities and for fish and wildlife habitat. Class B waters are suitable for compatible industrial processes and cooling, irrigation, and other agricultural uses. Class B waters also have consistently good aesthetic value. Some Class B waters are designated as suitable for public water supply with appropriate treatment.

- Class C waters are designated for secondary contact recreational activities and for fish and wildlife habitat. Class C waters are suitable for compatible industrial processes and cooling and for irrigation of crops that are intended for cooking before consumption. Class C waters also have good aesthetic value. This is the least stringent inland water classification.

The classes for coastal and marine waters are:

- **Class SA** waters are designated for primary and secondary contact recreational activities, and as excellent fish and wildlife habitat. Class SA waters also have excellent aesthetic value. Specific Class SA waters may be designated for shellfish harvesting in 314 CMR 4.00. Any desalination plant making withdrawals from a Class SA water must protect the existing and designated uses of the water. This is the most stringent coastal water classification and includes strict standards for bacteria, DO, and other characteristics to protect the designated uses of the water and human health.

- **Class SB** waters are designated for primary and secondary contact recreational activities and as fish and wildlife habitat. Class SB waters also have consistently good aesthetic value. Specific Class SB waters may be designated for shellfish harvesting in 314 CMR 4.00. Any desalination plant making withdrawals from a Class SB water must protect the existing and designated uses of the water.

- **Class SC** waters are designated for secondary contact recreational activities and as fish and wildlife habitat. Class SC waters are suitable for compatible industrial processes and cooling. Class SC waters also have good aesthetic value.

Most major waterbodies in Massachusetts are classified in 314 CMR 4.00. Waters not specified in the regulations are assumed to be Class B (inland) or Class SA (coastal). However, the regulations specify other ways that classifications can be determined. For example, tributaries to a drinking water supply (which would itself be designated Class A) would be designated as Class A waters in order to protect the intended uses downstream.

In addition to the water classifications in 314 CMR 4.00, MassDEP also maintains the *Massachusetts Integrated List of Waters*, which is updated every two years and provides more detail on individual waterbodies.[6] This list identifies what designated uses are attained, what impairments have been reported, and whether or not a TMDL has been prepared, if required. Waterbodies with ongoing impairments may require a TMDL for a given contaminant. TMDLs identify the major contributors to a given impairment (e.g., sources within a watershed that may contribute to the contamination or impairment) and specifies both general and individual discharge limits that must be met in order to reduce contaminant loading and improve the health of the waterbody. TMDLs are first developed in draft form and must be approved by USEPA in order to be implemented.

To summarize these details, the *Massachusetts Integrated List of Waters* divides waterbodies into various categories:

- **Category 1 Waters**: Waters attaining all designated uses.

- **Category 2 Waters**: Attaining some uses; other uses not assessed.

- **Category 3 Waters**: No uses assessed.

[6] Massachusetts Department of Environmental Protection, Division of Watershed Management. *Massachusetts Year 2006 Integrated List of Waters*. October 2007.

- **Category 4a Waters**: TMDL is completed.
- **Category 4c Waters**: Impairment not caused by a pollutant.
- **Category 5 Waters**: Waters requiring a TMDL.

Waterbodies used for drinking water supply were identified separately from the basic waterbody screening discussed above. Massachusetts Drinking Water Regulations (310 CMR 22.00) define three different Surface Water Supply Protection Zones that surround reservoirs and other surface drinking water sources as follows:

- **Zone A** represents:
  - the land area between the surface water source and the upper boundary of the bank;
  - the land area within 400 feet of the upper boundary of the bank of a Class A surface water source, defined in 314 CMR 4.05(3)(a); and
  - the land area within 200 feet of the upper boundary of the bank of a tributary or associated surface waterbody.
- **Zone B** represents the land area within one-half mile of the upper boundary of the bank of a Class A surface water source, or the edge of the watershed, whichever is less. Zone B always includes the land area within 400 feet of the upper boundary of the bank of a Class A surface water source.
- **Zone C** represents the land area not designated as Zone A or B within the watershed of a Class A surface water source.

The screening process identified three drinking water supplies with Zone A areas that would be crossed by one or more alternatives: the Farm River/Richardi Reservoir system, the Long Pond/Assawompset Pond/Pocksha Pond system, and the Brockton Reservoir (also known as the Avon Reservoir). Details on these water supplies are provided in the section on Surface Water Resources.

Groundwater Resources

Groundwater resource areas are defined and regulated pursuant to the *Massachusetts Drinking Water Regulations*. Many of the municipalities in and along the project alternatives have public drinking water supply wells near the rail corridors.[7] These wells can include municipal supplies as well as any supplies that provide water to at least 15 service connections. Table 4.17-2 lists each town and the number of public water supply wells identified. The number of wells varies greatly between municipalities.

[7] The definition of public water supplies in 310 CMR 22.02 includes any systems that provide at least 15 service connections or regularly serve an average of at least 25 individuals daily at least 60 days of the year.

Table 4.17-2 Public Water Supply Wells by Municipality

Municipality	Public Water Supply Wells	Municipality	Public Water Supply Wells
Berkley	0	Lakeville	7
Canton	6	New Bedford	0
Easton	6	Raynham	14
Fall River	0	Stoughton	12
Freetown	1	Taunton	3

Groundwater resource areas are defined and regulated pursuant to the *Massachusetts Drinking Water Regulations*. The groundwater supply protection areas (310 CMR 22.21) surrounding public water supply wells are described:

- **Zone I:** The protective radius required around a public water supply well or well field. This radius varies in size from 100 to 400 feet based on the approved yield of the well.
- **Zone II:** The area of an aquifer that contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated.
- **Zone III:** The area beyond Zone II from which surface water and groundwater drain into the Zone II.
- **Interim Wellhead Protection Area (IWPA):** The primary protected recharge area for public wells without a DEP-approved Zone II. The IWPA radius can range from a minimum of 400 feet to a maximum of 0.5 mile. The default radius is 0.5 mile.

The Groundwater Supply Protection regulations require that Zone I areas be "owned or controlled by the supplier of water" [310 CMR 22.21(1) (b)]. Zoning controls are required to restrict land use within Zone II and Zone III. Track, trains, roads, and parking areas are not prohibited uses in Zone II and Zone III areas.

Aquifers may be designated as Sole Source Aquifers (SSAs) by the USEPA if they provide at least 50 percent of a community's drinking water and there are no reasonable alternative drinking water sources available. Since the contamination of an SSA could leave residents without drinkable water, any projects proposed within an SSA that receive federal funding are subject to review by USEPA to ensure they do not endanger the aquifer. The proposed project alternatives do not cross any SSAs.

Details on the specific wells and protection areas near each alternative are provided in the section on Groundwater Resources.

4.17.2.2 Study Corridor

This section describes the existing conditions of surface water resources and public water supply wells that could be affected by the alternatives and identifies the specific resources that could be affected under each alternative. Figure 4.17-1 shows the project area and major waterbodies. Figure 1.4-1 illustrates the alternative alignments and associated station locations, in relation to these waterbodies.

Surface Water Resources

The classes and categories identified by MassDEP in the *Massachusetts Integrated List of Waters* and the *Massachusetts Water Quality Standards* (discussed in Section 4.17.2.1, *Regional Overview*) provide an effective summary of a waterbody's uses and overall health. Table 4.17-3 lists these and other relevant information for the waterbodies adjacent to the project. With one exception, these waterbodies are Class B or SB waters, indicating that they should be safe for recreational use and provide good fish and wildlife habitat but do not need to meet drinking water standards. The Wading River is considered a Class A water upstream of the Wading River Pumping Station in Mansfield and a Class B water downstream.

Table 4.17-3 Streams and Ponds Classified by MassDEP

Waterbody	Category	Class	ORW	Uses Attained	Impairments	TMDLs
Assonet River	2 and 5	B	No	Aquatic life, primary and secondary contact, aesthetics	Pathogens	
Beaver Meadow Brook	5	B	No		Organic enrichment/low DO, pathogens	Pathogens[1]
Cedar Swamp River	2	B	No	Aquatic life, primary and secondary contact, aesthetics		
Cotley River	3	B	No			
Forge Pond (Canton)	3	B	No			
Mill River	3	B	No			
New Bedford Inner Harbor	5	SB	No		Priority organics,- metals, nutrients, organic enrichment/low DO, pathogens, oil and grease, taste, odor and color, objectionable deposits	
Prospect Hill Pond	3	B	No			
Quequechan River	4c	B	No		Habitat alterations	
Queset Brook	3	B	No			
Rattlesnake Brook	2	B	No	Aquatic life, aesthetics		
Taunton River	5	B/SB[2]	No		Pathogens, organic enrichment/ low DO, additional unknown causes	Pathogens (draft)

1 Beaver Meadow Brook is covered by the pathogen TMDL for the Neponset River.

2 The Taunton River is considered a coastal water downstream of Route 24, where it is classified SB.

Not all of the streams identified in the screening process have been included in MassDEP assessments to date. Table 4.17-4 lists the named streams identified in the screening process that have not been

assessed by MassDEP in the *Massachusetts Integrated List of Waters* and were not assigned classes in 314 CMR 4.00. Most of these streams are assumed to be Class B waters (based on 314 CMR 4.00) and have no known TMDLs or impairments. However, Fall Brook is tributary to Long Pond in Lakeville and Freetown, which is a public drinking water supply. Therefore, Fall Brook is a Class A water as it is tributary to a drinking water supply.

Table 4.17-4 Named Streams and Ponds Not Assessed by MassDEP

Waterbody	Class	ORW
Black Brook	B	Yes
Fall Brook	A	Yes
Pierce Brook	B	No
Pine Swamp Brook	B	No
Steep Brook	B	No
Whitman Brook	B	No

There are three separate surface drinking water supplies that have protection zones crossed by or adjacent to the project alternatives. Table 4.17-5 lists the waterbodies that make up these water supplies.

Table 4.17-5 Surface Drinking Water Supplies

Waterbody	Category	Class	ORW	Impairments	Users	Relevant Tributaries[1]
Assawompset Pond	3	A	Yes		New Bedford, Taunton	Fall Brook
Long Pond	4c	A	Yes	Exotic species		
Pocksha Pond	3	A	Yes			

1 These are tributaries that are adjacent to the proposed project alternatives.

Further details on the resources that are in proximity to each specific alternative are provided below.

Southern Triangle Study Area (Common to All Build Alternatives)

The "Southern Triangle" portion of the project (Figures 4.17-2a-e and 4.17-3a-c) requires the railbed, track, and signals along the existing Fall River Secondary and New Bedford Main Lines to be upgraded for passenger rail traffic. This portion of the project extends from Weir Junction in Taunton along the New Bedford Main Line through Berkley, Lakeville, Freetown and New Bedford and along the Fall River Secondary from Myricks Junction in Lakeville through Freetown and Fall River. The Southern Triangle would cross or run adjacent to 10 waterbodies, listed in Table 4.17-6. The Southern Triangle also crosses the Zone A areas for Long Pond, Assawompset Pond, and Pocksha Pond, which provide drinking water for the cities of New Bedford and Taunton.

Table 4.17-6 Named Waterbodies Adjacent to or Crossed By the Southern Triangle

Waterbody	Municipality	Rail Segment	Relationship
Taunton River	Taunton	New Bedford Main Line	Crossed by bridge
Assawompset Pond	Freetown, Lakeville	New Bedford Main Line	Zone A crossed by alternative
Assonet River	Lakeville	Fall River Secondary	Within 100 feet of alternative
Cedar Swamp River	Lakeville	Fall River Secondary, New Bedford Main Line	Crossed by bridge
Cotley River	Berkley	New Bedford Main Line	Within 100 feet of alternative
Fall Brook	Freetown	New Bedford Main Line	Crossed by bridge
Forge Pond (Freetown)[1]	Freetown	Fall River Secondary	Within 100 feet of alternative
Long Pond	Freetown, Lakeville	New Bedford Main Line	Zone A crossed by alternative
New Bedford Inner Harbor	New Bedford	Fall River Secondary, New Bedford Main Line	Within 100 feet of alternative
Pierce Brook	Lakeville	New Bedford Main Line	Crossed by bridge
Pocksha Pond	Freetown, Lakeville	New Bedford Main Line	Zone A crossed by alternative
Quequechan River	Fall River	Fall River Secondary	Crossed by bridge
Rattlesnake Brook	Freetown	Fall River Secondary	Crossed by bridge
Steep Brook	Fall River	Fall River Secondary	Crossed by bridge

1 This Forge Pond is separate and distinct from the Forge Pond in Canton.

Taunton River—The Taunton River is a major river that extends from the confluence of the Town River and Matfield River in Bridgewater to Mount Hope Bay. The river has a roughly 562 square mile watershed that includes parts of 40 different municipalities and 94 square miles of wetlands. The river has been designated as a Wild and Scenic River by the National Park Service. This designation requires specific review by the Corps for any alteration of flows to the river or its tributaries, as well as the protection of the river's viewsheds and any historic or scenic structures associated with the river.

The Taunton River is a Class B waterbody, indicating that it is not suitable for untreated drinking water supply but should be suitable for primary and secondary contact recreation and provide good fish and wildlife habitat. The Taunton River is considered a coastal water downstream of the Route 24 bridge, where its classification changes from Class B to Class SB. The Taunton River is designated by MA DEP as impaired due to excess bacteria (pathogens), excess organic enrichment/low DO, and additional unspecified impairments. A draft TMDL for bacteria has been proposed for the Taunton River. The TMDL will not take effect until it is approved by the USEPA. Meeting this TMDL will require substantial reductions in bacteria loading from municipal stormwater runoff, leaking sanitary sewer lines, and combined sewer overflows (CSOs). Limitations have also been proposed for wastewater treatment discharges to the Taunton River and its tributaries.

The Taunton River is crossed several times on existing bridges just north of Weir Junction along the Stoughton Line and again just south of Weir Junction along the New Bedford Main Line.

Assawompset Pond, Long Pond, and Pocksha Pond—The Southern Triangle is not adjacent to Assawompset Pond, Long Pond, or Pocksha Pond, but it crosses the Zone A areas for all three in Freetown and Lakeville (4.17-2c). Long Pond is contiguous with Assawompset Pond and Pocksha Pond,

and they operate as a single waterbody. Together with Great Quittacas Pond, Little Quittacas Pond, and Elders Pond, these lakes provide drinking water for the cities of Taunton and New Bedford. Assawompset Pond was dammed at the Nemasket River in 1894, increasing the overall depth by approximately five feet. As a drinking water supply, the ponds are designated as Class A waterbodies and as ORWs. Long Pond is a Category 4c water and is listed as impaired due to exotic species. Assawompset Pond and Pocksha Pond are Category 3 waters, indicating that their intended uses have not been assessed by MassDEP.

Assonet River—The Assonet River (Figure 4.17-3a) is a tributary of the Taunton River and includes Assonet Bay, an inland waterbody with branches to the north, east, and south. The Assonet River continues east from Assonet Bay. The river is controlled by dams at Mill Street and at Forge Road in Assonet and continues upstream to Lakeville, where it becomes the Cedar Swamp River. The Assonet River is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. The Assonet River is listed as both a Category 2 water and a Category 5 water, indicating that it meets some of its assessed uses but is also in need of a TMDL. The Assonet River is considered to attain its intended uses for aquatic life, primary and secondary contact recreation, and aesthetics, but it is also impaired due to excess pathogens, which requires a TMDL.

Cedar Swamp River—As discussed above, the Cedar Swamp River (Figure 4.17-2b) is an upstream continuation of the Assonet River and is therefore tributary to the Taunton River. The swamp surrounding the Cedar Swamp River is protected as part of the Assonet Cedar Swamp Wildlife Sanctuary. Like the Assonet River, the Cedar Swamp River is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. The Cedar Swamp River is a Category 2 surface water and attains its intended uses for aquatic life, primary and secondary contact recreation, and aesthetics.

Cotley River—The Cotley River (Figure 4.17-2a) is a tributary of the Taunton River and runs through Barstows Pond to the Taunton River. The Cotley River is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. The Cotley River is a Category 3 surface water, indicating that its intended uses have not been assessed by MassDEP.

Forge Pond (Freetown)—Forge Pond is located in Freetown (Figure 4.17-3a) and should not be confused with the Forge Pond located in Canton. Forge Pond is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. Forge Pond is a Category 3 surface water, indicating that its intended uses have not been assessed by MassDEP.

New Bedford Inner Harbor—New Bedford Inner Harbor (Figure 4.17-2e) is the estuary of the Acushnet River, where the river flows into Buzzards Bay. The inner harbor is guarded by a hurricane barrier that protects boats in the harbor from severe storms. New Bedford Inner Harbor is a Class SB surface water, indicating that it should have consistently good aesthetic value and is intended for primary and secondary contact recreational activities and fish and wildlife habitat. The harbor is a Category 5 surface water and requires TMDLs to address impairments from priority organics, metals, nutrients, organic enrichment/low DO, pathogens, oil and grease, taste, odor and color, and objectionable deposits.

Quequechan River—The Quequechan River (Figure 4.17-3c) is a tributary of the Taunton River and runs from South Watuppa Pond to Battleship Cove on the Taunton River. The Quequechan River is a Class B surface water, indicating that it should have good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. The river is also a Category 4c surface water, indicating that it is impaired but that the impairment is not due to a contaminant. In this case, the river is impaired due to channelization of portions of the river, impacting its function as wildlife habitat.

Rattlesnake Brook—Rattlesnake Brook (Figure 4.17-3b) is a tributary of the Taunton River and runs through the Freetown-Fall River State Forest. The brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. Rattlesnake Brook is a Category 2 surface water and attains its intended uses for aquatic life and aesthetics.

Unlisted Waterbodies—Fall Brook (Figure 4.17-2c), Pierce Brook (Figure 4.17-2b) and Steep Brook (Figure 4.17-3b) are all crossed by the Southern Triangle but have not been included on the *Massachusetts Integrated List of Waters* by MassDEP.

Fall Brook is a tributary of Long Pond, which is contiguous with Assawompset Pond and Pocksha Pond. These ponds are part of the surface drinking water supply for New Bedford and Taunton. Therefore, Fall Brook is a Class A surface water, indicating that it is designated as a public drinking water supply (or is tributary to one) and should provide excellent fish and wildlife habitat, support primary and secondary contact recreational activities, and have excellent aesthetic value. Fall Brook is also an ORW, and the area within 400 feet of the brook is designated as Zone A.

Pierce Brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. The brook is located north of the Cedar Swamp River in the Assonet Cedar Swamp.

Steep Brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand.

Stoughton Alternative Study Area

The Stoughton Electric and Diesel Alternatives (Figures 4.17-4a through e) would provide commuter rail service through Stoughton, extending the existing Stoughton Line service. From Weir Junction in Taunton, trains would use the New Bedford and Fall River lines to reach the terminal stations. In addition to the 10 named waterbodies crossed by or adjacent to the Southern Triangle, the Stoughton Alternative (Electric and Diesel) would cross or run adjacent to eight named waterbodies. Table 4.17-7 lists the waterbodies unique to this alternative.

Information on the Taunton River is provided above. Other named waterbodies crossed by or adjacent to the Stoughton Alternative are discussed below.

Table 4.17-7 Named Waterbodies Adjacent to or Crossed By the Stoughton Alternative

Waterbody	Municipality	Rail Segment	Relationship
Beaver Meadow Brook	Canton	Stoughton Line	Crossed by bridge
Black Brook	Easton	Stoughton Line	Crossed by bridge
Forge Pond (Canton)[1]	Canton	Stoughton Line	Crossed by bridge
Mill River	Taunton	Stoughton Line	Crossed by bridge
Pine Swamp Brook	Raynham	Stoughton Line	Within 100 feet of alternative
Queset Brook	Easton	Stoughton Line	Crossed by bridge
Taunton River	Taunton	Stoughton Line	Crossed by bridge in
Whitman Brook	Easton, Stoughton	Stoughton Line	Crossed by bridge

Note: This table does not include waterbodies that are adjacent to or crossed by the Southern Triangle, listed in Table 4.17-6.
1 This Forge Pond is separate and distinct from the Forge Pond in Freetown that is crossed by the Southern Triangle.

Beaver Meadow Brook—Beaver Meadow Brook (Figure 4.17-4a) flows from Glen Echo Pond in Stoughton to Bolivar Pond in Canton. The brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. Beaver Meadow Brook is a Category 5 surface water and requires a TMDL to address organic enrichment/low DO. The brook is also impaired due to pathogens, which is covered by the bacteria TMDL for the Neponset River.

Forge Pond (Canton)—Forge Pond (Figure 4.17-4a) is located in Canton (not to be confused with the Forge Pond located in Freetown that is crossed by the Southern Triangle). Forge Pond is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. Forge Pond is a Category 3 surface water, indicating that its intended uses have not been assessed by MassDEP.

Mill River—The Mill River (Figure 4.17-4e) is located in Taunton and is a tributary of the Taunton River. The river runs from Lake Sabbatia through the City of Taunton to its confluence with the Taunton River. The Mill River is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. The Mill River is a Category 3 surface water, indicating that its intended uses have not been assessed by MassDEP.

Queset Brook—Queset Brook (Figure 4.17-4b) is located in Easton and is a tributary of the Taunton River. The brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. Queset Brook is a Category 3 surface water, indicating that its intended uses have not been assessed by MassDEP.

Unlisted Waterbodies—Black Brook (Figure 4.17-4c), Pine Swamp Brook (Figure 4.17-4d), and Whitman Brook (Figure 4.17-4b) are all crossed by The Stoughton Alternative (Electric and Diesel) but have not been included on the *Massachusetts Integrated List of Waters* by MassDEP.

Black Brook is located in Easton. The brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand.

Pine Swamp Brook is located in Raynham and runs from Prospect Hill Pond to the Taunton River. The brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand.

Whitman Brook is located in Stoughton and Easton. The brook is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand.

Whittenton Alternative Study Area

The Whittenton Alternative (Figures 4.17-4a-d and 4.17-5a-b) would avoid construction through the Pine Swamp. This would include restoration of the track system from the New Bedford Main Line up to Weir Junction in Taunton, and then connect to the Stoughton Line through the Whittenton Branch. In addition to the 10 named waterbodies crossed by or adjacent to the Southern Triangle, The Whittenton Alternative would cross or run adjacent to nine named waterbodies. Table 4.17-8 lists the waterbodies unique to this alternative. Information on Beaver Meadow Brook, Black Brook, Forge Pond, the Mill River, Pine Swamp Brook, Queset Brook, and Whitman Brook is presented above. Prospect Hill Pond is discussed below.

Table 4.17-8 Named Waterbodies Adjacent to or Crossed by the Whittenton Alternative

Waterbody	Municipality	Rail Segment	Relationship
Beaver Meadow Brook	Canton	Stoughton Line	Crossed by bridge
Black Brook	Easton	Stoughton Line	Crossed by bridge
Forge Pond (Canton)[1]	Canton	Stoughton Line	Crossed by bridge
Mill River	Taunton	Stoughton Line, Whittenton Branch	Crossed by bridge
Pine Swamp Brook	Raynham	Stoughton Line	Within 100 feet of alternative
Prospect Hill Pond	Taunton	Whittenton Branch	Within 100 feet of alternative
Queset Brook	Easton	Stoughton Line	Crossed by bridge
Whitman Brook	Easton, Stoughton	Stoughton Line	Crossed by bridge

Note: This table does not include waterbodies that are adjacent to or crossed by the Southern Triangle, listed in Table 4.17-6.
1 This Forge Pond is separate and distinct from the Forge Pond in Freetown that is crossed by the Southern Triangle.

Prospect Hill Pond—Prospect Hill Pond (Figure 4.17-5a) is located in Taunton and is the source of Pine Swamp Brook. The pond is a Class B surface water, indicating that it should have consistently good aesthetic and habitat values, is intended for primary and secondary contact recreation, and is not intended for drinking water supply without treatment beforehand. Prospect Hill Pond is a Category 3 surface water, indicating that its intended uses have not been assessed by MassDEP.

Station Sites

Twelve stations would be modified or constructed as part of the South Coast Rail project. Modifications are proposed at two existing stations (Canton Center and Stoughton). The modifications at the existing

Canton Center Station are limited to the construction of a new Americans with Disabilities Act- (ADA) compliant platform and canopy and do not involve the construction of additional impervious area. The existing Stoughton Station would be removed and replaced with a new station at a different location. New platform-only stations would be constructed at four sites: Easton Village, King's Highway, Whale's Tooth, and Battleship Cove. These are developed sites with existing parking facilities (King's Highway and Whale's Tooth) or are drop-off facilities without on-site parking (Easton Village and Battleship Cove). One station, at Fall River Depot, would be constructed on the site of the former railroad station and would include a structured parking facility that would maintain existing drainage patterns at the site.

Five new stations would be constructed that would discharge stormwater runoff to wetlands and would require compliance with the Stormwater Standards. Two of these stations (Taunton and Raynham Park) are located on previously developed sites. Three stations (North Easton, Taunton Depot, and Freetown) would be located on currently undeveloped sites.

None of the station sites contain surface water resources. However, many of the station sites are adjacent to waterbodies.

- The Battleship Cove, Taunton Depot, Freetown, Taunton, Raynham Park, and Freetown station sites are all within 100 feet of unnamed waterbodies. The Easton Village site is adjacent to Queset Brook, described above.

Layover Facility Study Areas

Two new overnight layover facilities are proposed as part of the South Coast Rail project. These facilities are proposed near the southern terminus of the New Bedford Main Line (Wamsutta) and the southern terminus of the Fall River Secondary (Weaver's Cove East). The facilities are necessary to provide locations for train sets to be stored overnight, for train crews to board the train at the start of each shift, and for minor maintenance activities to be performed to the trains.

- The Weaver's Cove East Layover Facility is located approximately 2.5 miles from the southern terminus of the Fall River Secondary line, between Main Street and the Secondary. The Wamsutta Layover Facility is located along the New Bedford Main Line, near the intersection of Wamsutta Street and Herman Melville Boulevard.

There are no source water resources located within the proposed layover facility options. However, the Taunton River is located approximately 100 feet from the Weaver's Cove East Facility. The Acushnet River is located approximately 400 feet from the Wamsutta Layover Facility site.

Groundwater Resources

The proposed alternatives have the potential to affect distinct public groundwater suppliers in the project area. These water suppliers were identified based on the Zone I and Zone II areas that would either be crossed by or within 100 feet of one or more alternatives. Table 4.17-9 lists the water suppliers that could be affected by the project and provides details on the extent and capacity of these water systems.

Table 4.17-9 Public Groundwater Supplies with Protection Zones Adjacent to or Crossed by the Alternatives

Water Supplier	Number of Wells	Wells with Potential Protection Zone Crossings	Typical System Pumping Rate (gallons per day)	Other Water Sources
Easton Water Division	6 wells	5 + 1 proposed	2 million	
North Raynham Water District	4 wells, 1 proposed well field,[1] 1 proposed well	5 + 2 proposed	340,000	Raynham is also served by the Raynham Center Water District.

1 Wellfields usually consist of multiple small-diameter wells pumped simultaneously.

This section discusses the groundwater protection zones that are crossed by or adjacent to the proposed project alternatives.

Southern Triangle Study Area (Common to All Build Alternatives)

The Southern Triangle would intersect the IWPAs for both of the wells operated by the Freetown-Lakeville Regional School District in Lakeville (Figure 4.17-2c). The wells themselves are located approximately half a mile east of the New Bedford Main Line.

Stoughton Alternative Study Area (Electric and Diesel)

In addition to the IWPA crossed by the Southern Triangle, the Stoughton Alternative (Electric and Diesel) would intersect Zone II areas for six wells, listed in Table 4.17-10.

Table 4.17-10 Public Water Supply Wells with Protection Areas Adjacent to or Crossed by the Stoughton Alternative (Electric and Diesel)

Well	Water System	Location of Well	Protection Zones within 100 feet of Project Area	Location of Protection Zone Crossings
Easton GP Well #1	Easton Water Division	Easton	Zone II	Easton, Stoughton
Easton GP Well #2		Easton	Zone II	Easton, Stoughton
Easton GP Well #4		Easton	Zone II	Easton, Stoughton
King Philip St. Well #3A	North Raynham Water District	Raynham	Zone II	Raynham
King Philip St. Well #3B		Raynham	Zone II	Raynham
King Philip Bedrock Well[1]		Raynham	Zone II	Raynham

Note: This table does not include the IWPA crossed by the Southern Triangle.
1 Proposed well

The Stoughton Alternative would intersect the Zone II for Easton GP Wells #1, #2, and #4, (Figure 4.17-4c), which are three of the six wells providing drinking water to the Town of Easton. Easton GP Well #1 is approximately 500 feet to the east of the Stoughton Line and is the well closest to this alternative. The Zone I for Easton GP Well #1 has a 400-foot radius, which is close to the alternative.

The alternative would also intersect the Zone II areas in Raynham for King Philip Street Wells #3A and #3B as well as the proposed King Philip Bedrock Well (Figure 4.17-4d). King Philip Street Wells #3A and #3b are approximately 1,800 feet east of the Stoughton Line. Although the King Philip Bedrock Well has

not been put into service, the surrounding area is protected in order to ensure that the aquifer will remain usable when the well is constructed.

Whittenton Alternative

In addition to the IWPA crossed by the Southern Triangle, the Whittenton Alternative would intersect Zone II areas for 10 existing or proposed wells and one Zone I area. Table 4.17-11 lists the wells with protection zones crossed by this alternative.

The Whittenton Alternative would cross the protection zones for all six of the North Raynham Water District's wells, including the Zone I for King Philip Street Well #2 (Figure 4.17-5a). King Philip Street Well #2 is within 200 feet of the Whittenton Branch, and the Zone I area for the well has a 400-foot radius. The Whittenton Alternative would cross the Zone II areas for King Philip Street Wells #1, #2, #3A, and #3B, the First Street Replacement Well, and the proposed Noblin Wellfield. King Philip Street Well #1 is near King Philip Street Well #2 and is approximately 900 feet southeast of the Whittenton Branch. The First Street Replacement Well (Figure 4.17-5d) is located between the Stoughton Line and the Whittenton Branch. The proposed Noblin Wellfield has not been constructed but will be located east of the Whittenton Branch on the far side of Prospect Hill Pond.

Table 4.17-11 Public Water Supply Wells with Protection Areas Adjacent to or Crossed by the Whittenton Alternative

Well	Water System	Location of Well	Protection Zones within 100 feet of Project Area	Location of Protection Zone Crossings
Easton GP Well #1	Easton Water Division	Easton	Zone II	Easton, Stoughton
Easton GP Well #2		Easton	Zone II	Easton, Stoughton
Easton GP Well #4		Easton	Zone II	Easton, Stoughton
Noblin Well Field[1]	North Raynham Water District	Raynham	Zone II	Raynham, Taunton
First St. Replacement Well		Raynham	Zone II	Raynham, Taunton
King Philip St. Well #1		Raynham	Zone II	Raynham, Taunton
King Philip St. Well #2		Raynham	Zone I and Zone II	Raynham, Taunton
King Philip St. Well #3A		Raynham	Zone II	Raynham
King Philip St. Well #3B		Raynham	Zone II	Raynham
King Philip Bedrock Well[1]		Raynham	Zone II	Raynham

Note: This table does not include the IWPA crossed by the Southern Triangle.
1 Proposed well

The Whittenton Alternative would intersect the Zone II for Easton GP Wells #1, #2, and #4, (Figure 4.17-4c) and would be close to the Zone I for Easton GP Well #1, already discussed above.

Station Sites

None of the station sites intersect any Zone I areas. The Easton Village and North Easton sites are within the Zone II for Easton GP Wells #1, #2, and #4.

Layover Facility Sites

None of the proposed layover facility sites are located within groundwater resource areas, particularly drinking water protection areas.

Summary

This section documents and describes the surface waterbodies and public surface and groundwater supply protection areas that are crossed by or in proximity to the Southern Triangle (common to all Build Alternatives), and the portions of the Build Alternatives that are north of Weir Junction in Taunton.

All Build Alternatives cross or are adjacent to surface waters and public water supply protection areas. Table 4.17-12 summarizes the resources that are crossed by or adjacent to each alternative.

Table 4.17-12 Summary of Water Resources Crossed By or Adjacent to Each Alternative[1]

Alternative or Element	Named Waterbodies	Public Water Supplies With Protection Areas Crossed by or Adjacent to Each Alternative: Zone A Areas[2]	Zone I Areas[3]	Zone II Areas[3]	IWPAs[3]
Southern Triangle	14	1	0	0	2
Stoughton	8	0	0	6	0
Whittenton	8	0	1	10	0
Layover Facilities	2	0	0	0	0

1 Based on waterbodies and water supply protection areas within 100 feet of the project area.
2 Surface water supplies that consist of connected waterbodies, such as a reservoir with a tributary, are treated here as a single supply and single Zone A.
3 Proposed construction within 400 feet. Each existing or proposed groundwater well is treated as a separate public water supply.

4.17.3 Analysis of Impacts and Mitigation

4.17.3.1 Introduction

This section identifies the impacts to water resources that may result from implementing each of the South Coast Rail alternatives under consideration (including railroad or highway alignments, train stations, and layover facilities).

Surface and groundwater resources are protected under several state and federal regulatory programs, including the federal Clean Water Act and the Massachusetts Clean Waters Act (MGL Chapter 21, §26-53). Other applicable regulations include the Massachusetts Discharge Regulations (314 CMR 9.00), Groundwater Quality Standards (314 CMR 6.00), Surface Water Quality Standards (314 CMR 4.00), and Wetland Protection Regulations (310 CMR 10.00). The Massachusetts Department of Environmental Protection (MassDEP) is in the process of adopting new stormwater regulations (314 CMR 21.00) that would require specific forms of stormwater management for projects above a certain size or projects located in watersheds with designated total maximum daily loads (TMDLs) for one or more pollutants. Some waterways are also regulated under MGL Chapter 91, which protects the public interest in tidelands, Great Ponds, and non-tidal rivers. More detail on compliance with regulations protecting coastal resources is provided in the Chapter 4.18, *Coastal Zone Consistency and Chapter 91 Compliance*. Impacts to floodplains are discussed in Chapter 4.16, *Wetlands.*

Prior to publication of the DEIS/DEIR, the Secretary's Certificate on the ENF for the South Coast Rail project included a number of requirements for water resources analysis that are addressed in this section. These requirements include:

- Include cumulative totals for land alteration and impervious area.
- Identify any discharges to ORW and provide supporting documentation if a variance pursuant to 310 CMR 4.00 is required.
- Analyze potential impacts to public and private water supplies (both existing and proposed) during the construction and operation of the project and propose avoidance, minimization, and mitigation measures to address impacts.
- Consult with MWRA regarding any potential impacts to MWRA properties or easements.[8]
- Evaluate potential stormwater impacts from construction and operation of the project and demonstrate compliance with stormwater regulations, including the proposed statewide stormwater regulations (314 CMR 21.00). This evaluation should include the rail tracks as well as station sites and layover facilities and should address potential impacts from oil, lubricants, and herbicides. Include plans for stormwater management and details on proposed low impact development (LID) techniques.
- Consult with MassDEP on proposed stormwater management design and construction—related stormwater issues, especially for any discharges to Zone I areas, Zone A areas, or ORWs.
- Existing culverted streams in the right-of-way, as relevant, should be analyzed for upstream and downstream effects under flooding conditions such as the 100-year storm.
- Provide detailed information on waterways that may be impacted by the project, and assess potential impacts to tidal and inland waterways.
- Include streams along Attleboro Secondary in the impact analysis.
- Address compliance with 310 CMR 9.32(2) by avoiding, minimizing, and mitigating any encroachment into a waterway within an ACEC. Other applicable standards include preserving public rights in waterways and providing open space for recreation at or near the water's edge.

Requirements in the Secretary's Certificate related to culverts, stream crossings, and wetland resources are addressed in the Chapter 4.16, *Wetlands.* Requirements regarding tidelands, coastal resources, Chapter 91 jurisdiction, and performance standards for water-dependent structures and uses requiring Chapter 91 authorization are addressed in the Chapter 4.18, *Coastal Zone Consistency and Chapter 91 Compliance*. Comments from MassDEP on the Expanded Environmental Notification Form (EENF) raised concerns about meeting existing and proposed Massachusetts Stormwater Management Standards requirements, using the MBTA's recent Greenbush Line project as an example, with particular focus on drinking water protection. Comments from the North Raynham Water District raised concerns about drinking water wells in Raynham, which have groundwater protection areas that are crossed by the Stoughton and Whittenton Alternatives. These concerns are addressed in this section.

[8] None of the alternatives assessed in this chapter would affect any known MWRA properties or easements.

The Secretary's Certificate on the DEIS/DEIR included the following specific requirements:

- "The FEIR should describe how the project will comply with the Massachusetts Stormwater Standards for work proposed in wetland resource areas and buffer zones pursuant to 310 CMR 10.05(6)(k) and 314 CMR 9.06(6), as well as other state and federal requirements (including total Maximum Daily Load (TMDL) requirements) for stormwater discharges to existing outfall and/or for the proposed layover facilities. The FEIR should describe measures to ensure that stormwater discharges to the Neponset River will meet the TMDL pathogen removal requirements and Total Suspended Soils (TSS) removal requirements."

- "The FEIR should include an assessment of the ability of the proposed project to meet the ten Massachusetts Stormwater Standards or specify if a variance to the Stormwater Standards specified at 310 CMR 10.05(6)(k) and 314 CMR 9.06(6) may be required. For those components of the project where complete raze of existing development is proposed, MassDOT should be fully meeting the Stormwater Standards rather than only "to the extent possible'' as few constraints exist in such situations."

- "The FEIR should include a detailed evaluation of Environmentally Sensitive Site Design (ESSD) and Low Impact Development (LID) practices to manage stormwater at proposed stations and parking areas, and layover facilities. The FEIR should identify the design capacity for parking at each station. Deck parking should be evaluated as an alternative to at-grade parking to minimize the project's impervious footprint and reduce the amount of land taking required. The ESSD and LID alternatives analysis in the FEIR should also include evaluation of smaller parking stalls and circulation lanes; porous pavement; pavement disconnection versus traditional curb and gutter drainage; retention of existing mature non-invasive plants; exfiltrating bioretention in place of raised traffic islands; and tree box filters. The FEIR should clearly identify the ESSD and LID measures to which the Proponent is committed to implement. For those measures not being committed to, the FEIR should include a sound rationale as to why they are not feasible."

- "The FEIR should include information on stormwater peak runoff rates and whether attenuation requirements will be met. The FEIR should assess each station and layover site to determine if there is sufficient land available for attenuation structures or if any additional right-of-way purchase would be required. For those stations being upgraded, the FEIR should include an analysis and description of measures to meet stormwater standards to the Maximum Extent Practicable (MEP) and to improve existing conditions, The FEIR should include an analysis of potential stormwater impacts to critical areas including vernal pools, and how these impacts will be addressed."

- "The FEIR should include details on proposed stormwater management along the proposed rail tracks. As noted in MADEP's comment letter, the Greenbush rail line included an extensive drainage system. The FEIR should describe the proposed drainage design for the Stoughton rail line and demonstrate that sufficient treatment will be provided prior to any discharge of track drainage runoff to resource areas. The FEIR should include a detailed description of the proposed stormwater management system for all components of the project. [MEPA] refers MassDOT to additional guidance regarding stormwater management in MADEP's comment letter."

Additional comments received on the DEIS/DEIR included the following:

Other comments on the DEIS/DEIR related to stormwater and water resources topics were provided by federal and state governmental agencies and other interested parties.

The Massachusetts Department of Environmental Protection (MADEP) submitted the following comments on the DEIS/DEIR:

- Provide information on the ability of the selected alternative to meet each of the 10 Massachusetts Stormwater Standards or specify if a variance to the Stormwater Standards specified at 310 CMR 10.05(6)(k) and 314 CMR 9.06(6) may be required.

- Provide alternatives analysis of Environmentally Sensitive Site Design (ESSD) and Low Impact Development (LID) practices to manage stormwater runoff at proposed stations and parking facilities, such as deck parking, smaller parking stalls and circulation lanes than traditional parking lots, use of porous pavements.

- Provide conceptual design examples of a new station, a reconstructed station, and a section of track in an environmentally sensitive area demonstrating how those structures would be constructed and operated consistent with ESSD and LID concepts.

- Provide information regarding whether stormwater peak runoff rate attenuation requirements will be met and if land-intensive peak rate control structures are needed, whether each station and layover facility contains sufficient land area and whether additional rights-of-way need to be purchased along potential rail line routes to place attenuation structures.

- Provide an analysis of stormwater recharge for its potential to attenuate peak runoff rates and where it cannot be met; describe the use of open attenuation structures over closed structures.

- Identify the design capacity of the parking proposed at each station. For stations with parking lots for 1,000 vehicle trips or more describe additional measures for source control and pretreatment (e.g. porous asphalt), as such parking lots are classified as Land Uses with Higher Potential Pollutant Loads (LUHPPL) and require pre-treatment specified at 310 CMR 10.05(6)(k)(5).

- Describe how each alternative would impact public drinking water sources, vernal pools and other critical areas pursuant to 310 CMR 10.05(6)(k)(6) and how each alternative's stormwater requirements will be addressed so as not to conflict with such critical areas.

- Describe how (in addition to point source stormwater runoff) controls, the alternatives will include source-control measures to minimize potential for contaminants and treatment for areas involving more than 1 acre of land disturbance, which is classified as a point source by USEPA for purposes of the Construction General Permit.

- Provide a description of how compliance with the Massachusetts Stormwater Standards will be achieved for work proposed in wetland resource areas and buffer zones pursuant to310 CMR 10.05(6) (k) and 314 CMR 9.06(6), as well as other state and federal requirements

(including Total Maximum Daily Load (TMDL) requirements) for stormwater discharges to existing outfalls and/or for the proposed layover facilities.

- For those components of the project where complete raze of existing development is proposed, demonstrate how the Stormwater Standards would be fully met rather than only "to the extent possible" as few constraints existing in such situations.

Other comments on the DEIS/DEIR related to water quality:

- Provide additional analysis of impacts on drinking water supply, especially for rail intersections with Zone IIs.
- Clarify the potential for contaminants (spills, drips, or exhaust) associated with rail operations to impact water quality in consideration of water quality data in the vicinity of active rail lines versus water quality data for comparable water resources not near an active rail line, as applicable and identify measures to minimize such impacts on water resources.
- Describe how nitrogen deposition in coastal embayments will be addressed more explicitly.
- Provide an analysis of potential environmental impacts that could be attributed to stormwater runoff associated with induced growth and estimate the maximum potential for stormwater contamination for each alternative.
- Describe how existing ditches along rail corridors that will be improved to ensure proper drainage will be designed to meet specifications listed in the Massachusetts Stormwater Handbook, Volume 2, so that they qualify as stormwater treatment BMPs.
- Include provisions in the Maintenance plan that prohibit the use of herbicides within Aquifer Protection Districts.
- Include in the project plans a Performance Guarantee against potential releases of Oils or Hazardous Materials that result in the contamination and subsequent disuse of drinking water wells.
- Provide for a 2-year pre-construction period of water quality testing and analysis to establish baseline conditions of the water bodies that would be receptors of aerial deposition of diesel exhaust.
- Update the 2006 MADEP's Massachusetts Integrated List of Waters with the most recent available MADEP data.
- Confirm the classifications identified for the water bodies described in Section 4.17.2.2 with the MassDEP.

This section evaluates specific impacts of each of the proposed alternatives to these water resources. Section 4.17.3.2 explains the methodology for evaluating direct and indirect impacts to water resources and describes potential pollutant sources. Section 4.17.3.3 identifies specific locations where impacts to water resources would occur under each alternative and discusses potential types of impacts. Section 4.17.3.5 summarizes the impacts that would be anticipated under each alternative. Section 4.17.3.6

summarizes the proposed mitigation measures to protect water resources, including steps taken to avoid impacts to water resources, possible ways to minimize impacts, and specific mitigation measures. Section 4.17.3.7 discusses the alternatives' compliance with relevant regulatory programs.

4.17.3.2 Impact Assessment Methodology

As required by the NEPA CEQ[9] the analysis of the environmental consequences requires discussion of the direct and indirect effects of a proposed action, and their significance. Direct effects are defined as those "which are caused by the action and occur at the same time and place."[10] Indirect effects are defined as those "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."[11]

Similarly, MEPA requires "a detailed description and assessment of the negative and positive potential environmental impacts of the Project and its alternatives. The EIR [Environmental Impact Report] shall assess (in quantitative terms, to the maximum extent practicable) the direct and indirect potential environmental impacts from the Project that are within the Scope. The assessment shall include both short-term and long-term impacts for all phases of the Project (e.g., acquisition, development, and operation) and cumulative impacts of the Project, any other Projects, and other work or activity in the immediate surroundings and region."[12]

For surface and groundwater resources, direct and indirect effects can usually be considered together, since direct and indirect effects are caused by the same sources. For example, any off-site or downstream impacts would have to be caused by on-site drainage or pollutant sources.

Potential effects on surface and groundwater resources were evaluated by reviewing areas where new construction would be required for each of the alternatives. For the purposes of this evaluation, "new construction" is defined as construction of stations and layover facilities, upgrades of existing rail lines, reconstruction of removed railroad infrastructure (e.g., old rails, ties, etc.) along historic railroad alignments, replacement of existing railroad bridges and culverts, construction of new permanent or temporary railroad bridges, reconfiguration of at-grade road/railroad crossings, and construction of new grade-separated road/railroad crossings. The purpose of this review was to identify where the rail corridors, stations, or layover facilities would pass through or be located in or adjacent to surface and groundwater resources or water resource protection areas. Maps and aerial photographs were examined in reference to preliminary engineering plans to identify potential effects on surface and groundwater resources.

Track and signal improvements are required throughout the system in order to provide commuter rail service that meets the project purpose. These improvements include minor alterations to vertical and horizontal track geometry, reconstruction of grade crossings and bridges, replacement of rail stock, and drainage improvements.

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[9] Code of Federal Regulations (CFR), Title 40: Protection of the Environment, Part 1502- Environmental Impact Statement, Section 1502.16 Environmental Consequences (40 CFR 1502.16).

[10] 40 CFR 1508.8(a).

[11] 40 CFR 1508.8(b).

[12] 301 Code of Massachusetts Regulations, Title 11.00: MEPA Regulations. Section 11.07- EIR Preparation and Filing, (6) Form and Content of EIR, (h) Assessment of Impacts. (11 CMR 11.07(6)(h)).

Throughout much of the project area, the existing track infrastructure included ditches along both sides of the track for drainage. These ditches have, in many places, been filled or blocked. As part of the proposed drainage improvements, the existing drainage features (ditches and culverts) would also be reconstructed in conjunction with the reconstruction of both active rail lines and the out of service segments. In general, these existing features follow the topography and natural drainage patterns of the corridor and would be rehabilitated or maintained as required in support of the project. In areas where the existing corridor alignment would be changed, the track profile would be altered, or subsequent development or disuse has eliminated surface drainage features, improved drainage features would be required. Improved stormwater management measures would be incorporated into the drainage design in order to comply with the DEP Stormwater Standards.

Although the horizontal and vertical track alignments have been refined since the DEIS/DEIR, the detailed grading plans and drainage analysis cannot be performed until a ground survey with 1-foot contours has been completed. Detailed grading plans and drainage analysis for the track would be completed in conjunction with final design. Specific drainage features have been developed in accordance with the requirements of the Secretary's Certificate. These features would be used where needed throughout the project area, particularly in stormwater critical areas or where other sensitive receptors are located.

For the impact analysis in Section 4.17.3.3, *Impacts of Alternatives by Element and Area*, potential stormwater discharges were identified based on the locations of any proposed stormwater outfalls, such as outlets from ditches, underdrains, detention ponds, or any other stormwater management features. In order to assess impacts conservatively, all discharges to waterbodies from a proposed drainage system were considered new discharges except where the proposed design would reuse a known, existing discharge point. In areas where no information was available on existing drainage designs, all proposed stormwater discharges should be assumed to be new discharges. Existing stormwater drainage features will be identified as the designs are refined, and the existing ditches and discharge points will be reused wherever possible throughout the project.

Potential impacts to drinking water wells were identified based on proposed activities within groundwater protection areas such as Zone I and Zone II areas. These protection areas are established by MassDEP around registered public drinking water supplies. Residences in some areas may not be served by municipal water systems but instead rely on individual private wells that may be located in proximity to one or more alternatives. An analysis of individual impacts to private wells was not performed for this report, but the steps taken to minimize the potential for groundwater contamination and drinking water supply impairment under each alternative would also reduce the potential for any impacts to private wells. Prior to the construction of any element discussed in this report, private wells would be located and inventoried. Based on this inventory, appropriate design modifications would be undertaken to minimize or avoid impacts to private wells.

Method for Assessing Direct Impacts

The limits of work proposed for each alternative were assumed to be the maximum extent of direct impacts. Potential direct impacts to water quality and quantity may result from a variety of actions:

- **Fill within surface waters**: Placing fill within a waterbody can disrupt the ecology of the streambed or lakebed and potentially increase flooding. During the construction period, placing fill may temporarily increase suspended sediment concentrations as well as the risk of contamination from spills or accidents with construction equipment.

- **Discharge of pollutants to surface waters**: Pollutants associated with the construction or operation of the project may contaminate local surface waters if spill controls and stormwater management features are not provided to contain or remove the pollutants. Contamination may occur from contaminated stormwater runoff or direct spills into a waterbody.

- **Discharge of pollutants to groundwater**: Pollutants associated with the construction or operation of the project may contaminate local groundwater supplies if spills or contaminated runoff are allowed to infiltrate into the ground. The potential consequences increase the closer the pollution source is to drinking water wells, as contamination close to a well may require additional treatment at the well to make the water safe to drink.

- **Changes in surface water hydrology**: Building new impervious surfaces, modifying channel geometry (such as by altering the shape of a culvert or the hydraulic opening beneath a bridge), or otherwise changing local drainage patterns can affect any receiving waters. Adding impervious surfaces to a watershed may change the hydrology by increasing the amount of runoff from precipitation. This can increase peak flows in surface waters, as flow rates during storms could increase due to the greater volume and rate of runoff. Increased peak flows of runoff can also promote erosion of soil and streambeds and potentially increase flooding. Changes in hydrology can also decrease or relocate flow, resulting in draining wetlands and streams.

- **Changes in groundwater recharge**: Building new impervious surfaces or otherwise changing local drainage patterns can reduce groundwater recharge, potentially reducing local groundwater supplies. Without mitigation, large-scale reductions in the groundwater supply may make low flows in streams more frequent and severe due to reduced baseflow (groundwater seeping into the stream through the streambed).

Method for Assessing Indirect Impacts

Direct impacts involving substantial changes to site hydrology or pollutant sources may also cause additional downstream impacts and increase the potential for flooding. These causes of these indirect (offsite) impacts are similar to those described under direct impacts.

- **Changes in stream geomorphology:** Increased peak flows result in bank erosion and/or down-cutting of stream systems. Sediment transported from eroding stream segments is deposited downstream in still water areas, resulting in shallower channels, higher water temperatures, and loss of deep water habitat.

- **Changes in bordering vegetated wetlands**: Stream down-cutting and reduced groundwater recharge impact adjacent bordering vegetated wetlands because lowered groundwater levels stress or eliminate wetland species as a result of the drying out that occurs.

- **Changes in water chemistry**: Some types of water-borne pollution are not harmful in and of themselves, however their presence may mobilize or alter naturally-occurring substances in ground or surface water that are harmful to aquatic life or are detrimental to human health.

- **Changes in water temperature**: Increases in water temperature, due to the discharge of cooling water from plants can disrupt the aquatic habitat values within waterbodies. In

addition, impervious surfaces like asphalt can absorb heat thereby, increasing the temperature of runoff, which adversely affects the temperature of the aquatic habitat in the receiving waters.

Method for Assessing Potential Pollutant Sources

Each alternative was assessed for any new pollutant sources that would be introduced, such as potential contaminants associated with the construction or operation of the alternative and any hazardous materials stored or used at or along the corridor (rail greasers, traction power stations, etc.). Depending on their design and location, these sources may or may not increase the risk of water resource contamination. The direct impact analysis pays specific attention to Zone I and Zone A drinking water protection areas, which merit the greatest consideration and protection in order to maintain the quality of regional drinking water supplies. Construction and operation of the South Coast Rail project is allowable within Zone I and Zone A areas, but potential pollutant sources must be managed carefully and contained to prevent any emissions or spills from contaminating drinking water supplies or other sensitive water resources.

Rail lines generate different types of stormwater pollutants than highways, parking lots, and other paved surfaces. Unlike the station sites and layover facilities, the track requires a more decentralized approach to stormwater management because the track is a linear feature with nearly negligible width and no centralized location where stormwater BMPs could be constructed. This section describes the potential contaminants that may be encountered along the rail corridor and are considered in the water resource impact analysis.

The various potential sources of pollutants that could be generated by the South Coast Rail project were reviewed in order to determine the different types of treatment measures that would be required to protect surface and groundwater resources. Most potential rail contaminants are due to the train traffic on the rails, which may result in hazardous contamination from spills, drips, or exhaust. Rail lines themselves are not significant sources of pollutants, as the rails and ballast are made of stable, non-hazardous materials. Most pollutants generated by train operations would be found adsorbed (attached) to the surface of the stone ballast supporting the rail ties. Rail lines generate different types of stormwater pollutants than highways, parking lots, and other paved surfaces. This section summarizes the major rail pollutant sources that are considered in the design of track drainage BMPs.

Hydrocarbons are the most common contaminants found on rail ballast, primarily from drips of fuel or other fluids from trains. Rail greasers are also used to lubricate the inside edges of the rails near tight curves to reduce wheel friction and noise. Excess grease may build up on the nearby ballast and contribute additional hydrocarbons to stormwater and groundwater.

For the Stoughton and Whittenton Electric Alternatives, traction power substations would be required at intervals along the corridor to provide power for the locomotives. The transformers in these power stations would be filled with oil, which could contaminate local water resources in the event of a leak or other accident. Transformers at traction power substations would incorporate secondary containment systems to prevent the release of oil as the result of a leak or other accident.

Train operations may generate trace amounts of iron, which wears off train steel wheels and steel rails. Brake pads may also contain metals such as zinc that are worn off as the brakes are used for slowing and stopping the train. It is not anticipated that metals from either source would be generated in sufficient quantities to pose a threat to surface or groundwater resources.

Commuter trains incorporate on-board sanitary facilities and therefore store and transport sanitary waste during everyday operations. The sanitary waste (pathogens) could pose a risk to water resources if the storage tanks were to leak during travel or spill during unloading. Unloading of sanitary sewage would be performed at an existing MBTA maintenance facility. Leaks and spills of sanitary sewage would be considered an illicit discharge and are prohibited by the Stormwater Standards and the Clean Water Act. A leak or spill would also violate the TMDL waste load allocation (WLA) in watersheds with approved pathogen TMDLs, as the WLA for illicit discharges is zero. The off-loading of sanitary sewage is proposed to occur at the mid-day layover facility and would be addressed in a separate report for that facility once a site is selected.

In contrast to roadways or buildings, the track and associated ballast are pervious surfaces that would generate negligible quantities of total suspended solids (TSS). However, significant quantities of TSS can be released as a result of construction activities, when large areas of exposed soil may be present. A Stormwater Pollution Prevention Plan (SWPPP) would be developed during final design that would identify BMPs that would be used to protect receiving waters from sediment discharges during the construction period. Aeolian (i.e., wind or atmospheric) deposition of fine particles that can be suspended by stormwater runoff would not be altered by the project. Such particles may be trapped by the ballast or may run off into the drainage system, much as occurs under existing conditions. As a result, aeolian depositions are not considered contaminants of that require treatment. Outlets from closed drainage systems and other drainage discharge points can cause erosion and release sediment into the receiving waterbody. New and reconstructed swales within the rail corridor would include water quality features such as check dams, sediment forebays, and outlet protection stone to reduce the concentration of TSS in runoff from the project area.

The rail lines would require limited use of herbicides to keep the rail corridors free of intrusive or obstructive vegetation. Overuse of herbicides near surface waters could introduce herbicides into surface waters and damage the overall health and biodiversity of waterbodies downstream. Comments on the DEIS/DEIR included the request that MassDOT provide a commitment to develop an approved Vegetation Management Plan (VMP) restricting the use of herbicides near Aquifer Protection Districts. Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*, discusses the use of herbicides along the track corridor and describes the VMP that would be developed for the project.

The Stoughton and Whittenton Electric Alternatives would not generate any exhaust within the rail corridor. If the Stoughton Diesel Alternative was selected, a small amount of emissions would be generated by train locomotives. However, aerial deposition of train-generated emissions is not a significant source of pollution of water resources because of the very low concentrations of pollutants in the vicinity of the track. Because trains are moving at operating speeds, emissions are dispersed over a large area and are not deposited adjacent to the track. Air quality and locomotive emissions are discussed in Chapter 4.9 of the FEIS/FEIR.

Potential Roadway Pollutants

Roadways, parking lots, and other impervious surfaces associated with the stations can contribute stormwater pollutants that are generated or deposited by the traffic they convey. However, stormwater that runs across these surfaces carry pollutants from other sources such as nearby land uses, wildlife and atmospheric deposition. The impact caused by an impervious area varies depending on the type of use that it receives, which can include new access roads, stations, parking areas, and layover facilities. Pollutants can collect on impervious surfaces and contaminate runoff, particularly the “first flush” of

runoff at the beginning of a storm. Airborne deposition of nutrients and pollutants can occur on both paved and unpaved areas. The largest source of airborne pollutants on a roadway is from vehicular exhaust. Therefore, pollutant loading from paved surfaces is more directly correlated to the amount and type of traffic they receive rather than the total area of pavement. For example, a heavily-travelled roadway or high-turnover parking lot is subject to greater deposition of hydrocarbons, salts, heavy metals, and exhaust by vehicles and road treatments than lower-usage facilities of comparable size. As a result, higher-usage areas can contribute greater quantities of pollutants to runoff.

As a result of fecal deposition by birds and other wildlife, impervious surfaces may contribute some bacteria to stormwater, but they are not a major source of bacteria when compared to the potential impacts of septic systems or combined sewer overflows (CSOs). The potential for bacteria contribution varies with the type of roadway. Local roads where wildlife and domestic pets have abundant access are more likely to contribute bacteria to stormwater than highways that offer little or no access for animals and pedestrians.

Impervious surfaces like asphalt also absorb heat and can therefore increase the temperature of runoff, affecting the temperature of the aquatic habitat in the receiving waters. The increase in impervious surfaces could therefore have an impact on the temperature of runoff, just as the urbanized runoff from neighborhoods is warmer than runoff from vegetated areas. The travel of runoff through swales and surface channels prior to reaching any major waterbodies would reduce the thermal impact by evaporation and infiltration.

Methods to Assess Compliance with Stormwater Management Standards

The stormwater management features at each station site and layover facility were evaluated for compliance with state and federal stormwater regulations and with the requirements of the Secretary's Certificate. State regulations include the Stormwater Regulations at 310 CMR 10.05(6)(k); the Surface Water Quality Standards at 314 CMR 4.00; and the Clean Water Act Section 401 Water Quality Certification at 314 CMR 9.00. Federal regulations include the National Pollutant Discharge Elimination System (NPDES) regulations under the Clean Water Act (33 U.S.C. §1251 et seq.) and the Federal Water Pollution Control Act (33 U.S.C. §1342).

Evaluations were conducted for the five new stations that would discharge stormwater runoff to wetlands and would require compliance with the Massachusetts Stormwater Standards. The evaluations included hydrologic analysis, hydraulic analysis, geotechnical analysis, floodplain review, and Environmentally Sensitive Site Design (ESSD) and Low Impact Development (LID) evaluations. Non-structural BMPs for water quantity and quality control were evaluated for each station site and would be further refined during the final design process. Non-structural BMPs include measures such as snow management, spill prevention, and source control practices. Structural BMPs for water quantity and quality control were also evaluated for each station site and were selected to provide treatment trains appropriate for each site. Structural BMPs include catch basins with deep sumps and hoods, oil/grit separators, vegetated filter strips, vegetated swales, bioretention swales, bioretention basins, and infiltration basins. These analyses were not conducted for the relocated Stoughton Station as this site has not yet been advanced to preliminary design; these analyses would be conducted at a future date.

For the Weaver's Cove East Layover Facility, these evaluations included hydrologic analysis, hydraulic analysis, geotechnical analysis, floodplain review, and ESSD and LID evaluations. Except for floodplain review, these analyses were not conducted for the Wamsutta Layover Facility as this site has not yet been advanced to preliminary design; these analyses would be conducted at a future date. Non-

structural BMPs for Water Quantity and Quality Control were evaluated for each layover facility and would be further refined during the final design process. Non-structural BMPs include measures such as Snow Management, Spill Prevention, and Source Control practices. Structural BMPs for Water Quantity and Quality Control were also evaluated for each layover facility and were selected to provide treatment trains appropriate for each site. Structural BMPs include drip trays, catch basins with deep sumps and hoods, oil/grit separators, gravel and grass filter strips, vegetated swales, sediment forebays, and infiltration basins.

Railroad layover facilities are considered a LUHPPL as defined in 310 CMR 10.04 and 314 CMR 9.02. As a result, certain BMPs are required to prevent contamination of local wetlands and water resources such as the New Bedford Inner Harbor or the Taunton River. The storage tracks would have drip pans (collection trays) to catch any incidental drips, leaks, or spills of hazardous materials that may occur during storage or maintenance. The drip pans would be connected to an oil/grit separator that would separate petroleum products from stormwater runoff prior to discharge, protecting wetland and water resources from contamination. Any oil or other hazardous materials stored at the site would be secured with secondary containment structures to catch any spills. With the proposed containment measures in place, neither layover facility would pose a significant risk to surface or groundwater resources. The electric alternatives and the diesel alternatives differ as follows with regard to potential pollutants:

- Fuel spills and ballast contamination is a greater concern for alternatives using diesel locomotives than for those with electric ones, since the electric vehicles would not use any diesel fuel or generate any exhaust. However, aerial deposition of diesel train-generated emissions is not a significant source of pollution of water resources because of the very low concentrations of pollutants in the vicinity of the track. Since trains are moving at operating speeds, emissions are dispersed over a large area and are not deposited adjacent to the track.

- Electric railroads require traction power substations to provide power for the locomotives. The transformers in these power stations would be filled with oil, which could contaminate local water resources in the event of a leak or other accident.

4.17.3.3 Impacts of Alternatives by Element and Area

This section evaluates the potential impacts to surface and groundwater resources associated with the alternatives. These alternatives include the No-Build Alternative (Enhanced Bus), Stoughton Alternative (Electric and Diesel), and Whittenton Alternative (Electric and Diesel). The alternatives considered would include construction of new rails, stations, and layover facilities. Figure 4.17-1 shows the major surface waterbodies throughout the project area. Figure 1.4-1 shows the route for each alternative and proposed station locations.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would improve transit service to Boston from New Bedford, Fall River, and Taunton by adding more buses and improving park-and-ride capacity and amenities with smaller capital investments than are proposed in the Build Alternatives. Under this alternative, no new rail or bus service would be provided to Southeastern Massachusetts. Three existing park-and-ride facilities (West Bridgewater, Mt. Pleasant Street, and Silver City Galleria) would be improved as part of the No-Build Alternative.

The West Bridgewater Park-and-Ride is near the southwest corner of the intersection of Routes 106 and 24 in West Bridgewater. Under the No-Build Alternative, the existing parking lot would be restriped for optimal capacity and efficiency. The improvements would occur within the existing lot and would not add any impervious surfaces or new pollutant sources. No changes to stormwater drainage would occur, and there would be no impact to water resources.

The Mt. Pleasant Street Park-and-Ride is on the northwest corner of the intersection of King's Highway and Route 140 in New Bedford. Under the No-Build Alternative, the existing lot would remain unchanged, and a new pickup location would be added using the existing parking lot at the proposed Whale's Tooth Station. Due to the existing uses of these sites and the proximity to existing highways and parking areas, changes to the park-and-ride facility would not introduce any new uses or pollutant sources to the area. There would be no expansion or construction needed for either parking lot, resulting in no new impervious area and no impact on waterbodies or drinking water protection areas.

The Silver City Galleria Park-and-Ride is adjacent to the Silver City Galleria shopping mall in Taunton. Under the No-Build Alternative, the existing parking lot would be restriped for optimal capacity and efficiency. The improvements would occur within the existing lot and would not add any impervious surfaces or new pollutant sources. No changes to stormwater drainage would occur, and there would be no impact to water resources.

As under existing conditions, the park-and-ride facilities would contribute roadway pollutants such as metals, hydrocarbons, salt, and sediment, all of which are associated with automobile traffic. The improvements to the park-and-ride facilities would not introduce new pollutant sources and would be expected to be, at most, incremental. No impacts to water resources are expected from expanding the park-and-ride facilities for the No-Build Alternative. These facilities would increase parking capacity in existing developed areas and would not substantially increase impervious area, automotive traffic, or stormwater pollution.

Build Alternatives

This section first describes typical stormwater management facilities and methods common to all Build Alternatives. This is followed by a discussion of impacts in the Southern Triangle, which is common to all Build Alternatives. This is followed by a description of impacts in the northern part of the South Coast Rail study area where the Build Alternatives differ in their alignments and where impacts are discussed separately for each alternative. This is followed by a description of impacts associated with station sites and layover facility sites for the entire study area.

Track Drainage (Common to all Build Alternatives)

As previously mentioned, the track requires a more decentralized approach to stormwater management because the track is a linear feature with nearly negligible width and no centralized location where stormwater BMPs could be constructed. The existing track infrastructure included ditches along both sides of the track for drainage. In many places, these ditches have been filled or blocked and are no longer capable of providing adequate drainage for the rail bed. As part of the track reconstruction project (in all segments of the rail lines), these ditches would be reconstructed to maintain proper drainage.

Under both existing and proposed conditions, stormwater would be conveyed through overland flow and through a drainage system consisting of drainage ditches alongside the tracks or underdrains installed in the rail ballast. In areas where no ditches or underdrains would be required to keep the rail

bed dry, such as areas where the rail would be elevated above the surrounding land, stormwater is assumed to leave the rail corridor by overland flow, resulting in no point discharges of stormwater. In areas where the rail would run through a cut section, ditches and underdrains would be required to direct stormwater to safe discharge locations and to keep the ballast dry and stable.

Discharges from track drainage would be directed away from stormwater critical areas such as Outstanding Resource Waters (ORWs) and into adjacent upland areas to the maximum extent practicable. ORWs in the vicinity of the track include vernal pools, wetlands and waterways within the Hockomock Swamp ACEC, and tributaries to surface drinking water supplies. Selection of appropriate treatments for each location would occur during final design as part of the detailed grading plans and drainage analysis. Any treatments proposed would be constructed in a manner consistent with other measures intended to avoid, minimize and mitigate wildlife habitat impacts including between tie passages to facilitate movement of wildlife across the railbed, as well as the trestle within a section of the Hockomock Swamp.

A number of stormwater Best Management Practices (BMPs) would be incorporated. Drainage into the underdrains would contain minimal pollutants, as most suspended solids and other contaminants would be caught in the ballast above the underdrains. The use of surface ditches would allow stormwater infiltration as well as settling of suspended solids, reducing stormwater volumes and contaminant loads prior to discharge to any waterbodies or wetlands. Sediment forebays and check dams would be installed upstream of discharge points to provide additional sediment removal. Outfalls would be protected using crushed stone or concrete structures, as appropriate, to prevent erosion in the receiving waters or wetlands. Because the surface of the rail corridor consists of pervious stone ballast and does not include new impervious surfaces, there would be no change in the peak discharge rate from the rail corridor and no BMPs that provide rate control are required.

In accordance with the Secretary's Certificate, drainage improvements are proposed that would protect wetland and water resources in the vicinity of the rail corridor. Stormwater and drainage design plans from the Greenbush Commuter Line project, completed in 2007, were reviewed and stormwater management features from the track design have been incorporated into the project design. The specific percentage of credit granted for TSS removal from proposed measures would be evaluated as stormwater system design details become developed. MassDEP would be consulted during the design of project elements to ensure these standards are implemented.

Track drainage elements include vegetated drainage swales, sediment forebays with check dams, perforated pipe underdrains, stone swales with high density polyethylene (HDPE) liners, outlet protection stone, and infiltration trenches. These BMPs and the criteria used to determine where particular treatments should be used are described below.

Vegetated Drainage Swales

Vegetated drainage swales are proposed in order to provide positive drainage for the track ballast, maintain open space, and to allow runoff to infiltrate to the extent practicable. Side slopes of the swale may be no steeper than 2:1 and the floor of the swale must be at least 2 feet wide. The longitudinal slope of the swale must be less than 5 percent and maximum velocities should be less than 1 foot per second during the water quality event. Swales should end at sediment forebays with check dams. A typical detail and plan view of a vegetated drainage swale is shown on Figure 4.17-6.

Sediment Forebays

Sediment forebays with stone check dams are proposed at locations where swales discharge runoff to wetland resource areas. A typical detail and plan view of a sediment forebay and stone check dam is shown on Figure 4.17-6.

Perforated Pipe Underdrains

Perforated pipe underdrains are proposed for locations where the track corridor is constrained or where the adjacent grading does not allow open channel flow. Per MBTA design guidelines, a minimum pipe size of 12 inches is required. Underdrains shall be bedded in a trench filled with ¾-inch crushed stone wrapped in filter fabric. Cleanouts shall be spaced no more than 500 feet apart. A typical detail and plan view of a perforated pipe sub-drain is shown on Figure 4.17-7.

HDPE-Lined Swales

Stone-lined swales with HDPE liners are proposed in locations where the track is less than 200 feet from the Zone 1 of a drinking water supply well. This occurs in the vicinity of the Easton GP Well #1 on Gary Lane in Easton. In accordance with MassDEP regulations, drainage in this area would be directed away from the Zone 1. A typical detail and plan view of a stone-lined swale with an HDPE liner is shown on Figure 4.17-8.

Stone-lined swales with HDPE liners are also proposed in locations where vernal pools are located immediately adjacent to the track in order to prevent the track drainage from dewatering the pool. These locations would use the same detail as shown on Figure 4.17-8

Outlet Protection

Stone-lined scour protection pads are proposed at each end of swale and pipe segments to protect adjacent soils from erosion and to trap coarse debris. Scour protection stone and energy dissipation bowls must be sized for the discharge rates anticipated at each outlet. Details of a flared end section with stone scour protection and a headwall with stone scour protection are shown on Figure 4.17-9**.**

Southern Triangle Study Area (Common to All Build Alternatives)

Portions of the rail lines within the southern part of the South Coast Rail study area are common to all Build Alternatives (Figures 4.17-3a-c and 4.17-2a-e). These rail lines form a rough triangular shape running from Fall River to Myricks Junction (the Fall River Secondary Line) and from New Bedford to Weir Junction (the New Bedford Main Line), and are referred to as the Southern Triangle. Potential impacts to water resources along the Southern Triangle are described below.

Fall River Secondary Rail Segment

The existing Fall River Secondary freight track would be upgraded to Federal Rail Administration (FRA) Class 5[13] for the South Coast Rail project. Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one in Freetown (Freetown). One new layover facility would be constructed in Fall River, at the Weaver's Cove site. Potential impacts to water resources resulting

[13] 49 CFR 213.9 Classes of Track: Operating Speed Limits

from developing the new stations and layover facilities are considered in the sections on Station and Layover Facility sites, respectively.

Table 4.17-13 lists waterbodies near the Fall River Secondary and identifies the waterbodies that would receive stormwater discharges from the rail line. Forge Pond, the Assonet River, and the Taunton River would all receive stormwater discharges from the rail drainage system. There would also be a discharge near the confluence of the Quequechan River and the Taunton River that would not affect the Quequechan River upstream. All other stormwater discharges from the Fall River Secondary would go to local wetland systems rather than to named waterbodies. Cedar Swamp River, Rattlesnake Brook, and Steep Brook would be crossed by the line but would not receive any direct stormwater discharges. No Zone A areas or groundwater protection areas (Zone I, Zone II, etc.) would be crossed by this line or receive any stormwater discharges. Potential impacts from the construction of culverts and other waterway crossings are discussed in Chapter 4.16, *Wetlands.*

Table 4.17-13 Stormwater Discharges on the Fall River Secondary Line

Waterbody	Municipality	ACEC/ ORW	Stormwater Discharges Proposed
Assonet River	Lakeville	No	Yes
Cedar Swamp River	Lakeville	No	No
Forge Pond (Freetown)[1]	Freetown	No	Yes
Quequechan River	Fall River	No	No[2]
Rattlesnake Brook	Freetown	No	No
Steep Brook	Fall River	No	No
Taunton River	Fall River	No	Yes
Terry Brook[3]	Freetown	No	Yes

1 This Forge Pond is separate and distinct from the Forge Pond in Canton.
2 A stormwater discharge occurs near the confluence of the Quequechan River and the Taunton River but would not affect the Quequechan River.
3 The Fall River Secondary crosses Terry Brook Pond, an impounded section of Terry Brook that is bisected by the Fall River Secondary alignment.

The stormwater discharges from the Fall River Secondary segment would not be expected to contribute contaminants that would impair any of these waterbodies. No new impervious surfaces would be constructed as part of the rail line itself, resulting in no changes in runoff rates. The track upgrades and new traffic would not introduce new pollutant sources because the Fall River Secondary rail segment is already an active rail line.

As described in Section 4.17.3.2, *Impact Assessment Methodology*, the rail corridor would use a combination of drainage ditches alongside the tracks and underdrains installed in the rail ballast to keep the railbed dry and stable. Potential temporary, construction-period impacts to surface and groundwater resources are discussed in Section 4.17.3.4, *Temporary Construction Impacts*. Mitigation proposed to prevent contamination of surface and groundwater resources from the pollutant sources discussed in the section on Potential Pollutant Sources are discussed in Section 4.17.3.6, *Mitigation*.

New Bedford Main Line Rail Segment

The existing New Bedford Main Line freight track would be upgraded to FRA Class 5 for the South Coast Rail project. Two new train stations would be constructed in New Bedford (Whale's Tooth and King's Highway) and one near Taunton (Taunton Depot). One new layover facility would be constructed in New

Bedford, at the Wamsutta site. Potential impacts to water resources resulting from developing the new stations and layover facilities are considered in the sections on Station and Layover Facility sites, respectively.

Table 4.17-14 lists waterbodies near the New Bedford Main Line and identifies the waterbodies that would receive stormwater discharges from the rail line. In Taunton, the Taunton River would receive stormwater discharge from the rail drainage system. All other stormwater discharges from the New Bedford Main Line would go to local wetland systems or municipal systems rather than directly to named waterbodies. Cedar Swamp River, Cotley River, and Pierce Brook would be crossed by the line, and New Bedford Inner Harbor is close to the line, but none of these waterbodies would receive any stormwater discharges from the proposed drainage system. There would be no direct stormwater discharges to Fall Brook, which is an Outstanding Resource Water (ORW). There would be stormwater discharges to the combined Zone A area associated with Fall Brook, Assawompset Pond, Long Pond, and Pocksha Pond. These discharges would be allowable under Massachusetts Stormwater Management Standards (310 CMR 10.05(6)) and the proposed Stormwater Management Regulations (314 CMR 21.00) because the New Bedford Main Line is an existing rail line. Zone A discharges are allowable if they originate on previously-developed impervious surfaces and if the discharge does not increase pollutant loadings to the drinking water supply in question. The improvements proposed to the New Bedford Main Line would not add any impervious surfaces to this area or increase pollutant loadings to Fall Brook or the water supplies downstream.

Table 4.17-14 Stormwater Discharges on the New Bedford Main Line

Waterbody	Municipality	ACEC/ORW	Stormwater Discharges Proposed
Assawompset Pond (Zone A only)	Freetown, Lakeville	No	Yes (Zone A only)
Cedar Swamp River	Lakeville	No	No
Cotley River	Berkley	No	No
Fall Brook (includes Zone A)	Freetown	Yes	Yes (Zone A only)
Long Pond (Zone A only)	Freetown, Lakeville	No	Yes (Zone A only)
New Bedford Inner Harbor	New Bedford	No	No
Pierce Brook	Lakeville	No	No
Pocksha Pond (Zone A only)	Freetown, Lakeville	No	Yes (Zone A only)
Taunton River	Taunton	No	Yes

None of the substations proposed on this line for the electrically-powered alternatives would be located in any Zone A areas or groundwater protection areas. Potential impacts from the construction of culverts and other waterway crossings are discussed in Chapter 4.16, *Wetlands.*

All Build Alternatives would require construction within the interim wellhead protection areas (IWPAs) for the two wells operated by the Freetown-Lakeville Regional School District in Lakeville. The wells are approximately 0.5 mile east of the New Bedford Main Line. There would be no stormwater discharges within this IWPA, with drainage redirecting stormwater flows to the west side of the tracks away from the wells.

The stormwater discharges from the New Bedford Main Line would not be expected to contribute contaminants that would impair any waterbodies or water supplies. No new impervious surfaces would be constructed as part of the rail line itself, resulting in no changes in runoff rates. The track upgrades and new traffic would not introduce new pollutant sources because the New Bedford Main Line is already an active rail line.

There would be no stormwater discharges within the IWPA for the Freetown Lakeville Regional School District. The existing stormwater discharges to the Zone A area for Fall Brook, Assawompset Pond, Long Pond, and Pocksha Pond would continue, but there would be no new impervious surfaces or pollutant sources tributary to this Zone A area. Due to the low potential for pollutant generation on the rail line, no impacts are expected to groundwater quality.

As described in Section 4.17.3.2, *Impact Assessment Methodology,* the rail corridor would use a combination of drainage ditches alongside the tracks and underdrains installed in the rail ballast to keep the railbed dry and stable. Potential temporary, construction-period impacts to surface and groundwater resources are discussed in Section 4.17.3.4, *Temporary Construction Impacts*. Mitigation proposed to prevent contamination of surface and groundwater resources from the pollutant sources discussed in the section on Potential Pollutant Sources are discussed in Section 4.17.3.6, *Mitigation.*

Stoughton Electric Alternative

The Stoughton Electric Alternative alignment would be comprised of a portion of the Northeast Corridor and the Stoughton Line (Figures 4.17-4a-e). This alternative would use the Northeast Corridor from South Station to Canton Junction, and the existing Stoughton Line from Canton Junction to Stoughton Station. From that point, commuter rail service would be extended, using an out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton, where it would join the northern end of the Southern Triangle. This evaluation focuses on the Stoughton Line component only. This alternative would include the following stations: Canton Center, Stoughton, North Easton, Easton Village, Raynham Park, and Taunton. No layover facilities are planned within this segment. Potential impacts to water resources resulting from developing the new stations are considered in the section on Stations.

The existing Stoughton Line commuter rail track from Canton Junction to Stoughton would be upgraded to FRA Class 5 for the Stoughton Electric Alternative. New track would be placed on the railroad bed from Stoughton south to Weir Junction. A section from Foundry Street in Easton to Raynham Station through the Hockomock Swamp would be constructed on an elevated trestle. Two existing train stations along the Stoughton Line would be reconstructed (Canton Center and Stoughton). Four new train stations would be constructed along this alignment (North Easton, Easton Village, Raynham Park, and Taunton).

Table 4.17-15 lists waterbodies near the Stoughton Line and identifies the waterbodies that would receive stormwater discharges from the rail line. Beaver Meadow Brook, the East Branch Neponset River, Forge Pond, Mill River, Queset Brook, and the Taunton River would all receive stormwater discharges from the Stoughton Line. Black Brook, which is located within the Hockomock Swamp ACEC, would not receive any stormwater discharges, although there would be stormwater discharges to wetlands and unnamed channels near Black Brook. Black Brook, Pine Swamp Brook, and Whitman Brook would all be crossed by the Stoughton Line but would not receive any stormwater discharges from the proposed drainage system. No Zone A areas would be affected by construction on this line. Potential impacts from the construction of culverts and other waterway crossings are discussed in Chapter 4.16, *Wetlands*.

Table 4.17-15 Stormwater Discharges on the Stoughton Line

Waterbody	Municipality	ACEC/ORW	Stormwater Discharges Proposed
Beaver Meadow Brook	Canton	No	Yes
Black Brook	Easton	Yes[1]	No
East Branch Neponset River[2]	Canton	Yes[3]	Yes
Forge Pond (Canton)[4]	Canton	No	Yes
Mill River	Taunton	No	Yes
Pine Swamp Brook	Raynham	No	No
Queset Brook	Easton	No	Yes
Taunton River	Taunton	No	Yes
Whitman Brook	Easton, Stoughton	No	No

1 Hockomock Swamp ACEC.
2 East Branch Neponset River is sometimes referred to as the Canton River.
3 Fowl Meadow and Ponkapoag Bog ACEC.
4 This Forge Pond is separate and distinct from the Forge Pond in Freetown that is crossed by the Southern Triangle.

The Stoughton Alternative would require construction in Zone II areas for six public water supply wells along the Stoughton Line. There would also be stormwater discharges from the Stoughton Line in the Zone II areas for these six wells. The wells associated with these protection areas include three wells operated by the Easton Water Division and three wells operated by the North Raynham Water District. The individual wells and their protection zones are listed in Table 4.17-16. The Zone II areas crossed by the proposed Stoughton Line already contain developed areas and residential neighborhoods that are likely to have much larger impacts on water quality than a rail corridor. No Zone I areas would be affected by the construction on this line. Since the construction would occur on an out of service railroad bed, there would be no expected change in groundwater flow. No electrical substations would be located in any IWPAs, Zone I areas, or Zone A areas. One electrical substation would be located in the Zone II for Easton GP Wells #1, #2, and #4 and would include secondary containment to minimize the risk of any surface or groundwater contamination from this location.

Table 4.17-16 Construction and Stormwater Discharges in Public Water Supply Well Protection Areas on the Stoughton Line

Well	Distance From Proposed Limit of Work (miles)	Water System	Location of Protection Zone Crossings	Construction in Protection Zones	Stormwater Discharges in Protection Zones
Easton GP Well #1	0.1	Easton Water Division	Easton, Stoughton	Zone II	Zone II
Easton GP Well #2	0.4		Easton, Stoughton	Zone II	Zone II
Easton GP Well #4	0.3		Easton, Stoughton	Zone II	Zone II
King Philip St. Well #3A	0.3	North Raynham Water District	Raynham	Zone II	Zone II
King Philip St. Well #3B	0.3		Raynham	Zone II	Zone II
King Philip Bedrock Well[1]	0.5		Raynham	Zone II	Zone II

1 Proposed well

The stormwater discharges from the Stoughton Line would not be expected to contribute contaminants that would impair any waterbodies or water supplies. No new impervious surfaces would be constructed as part of the rail line itself, resulting in no changes in runoff rates. The portion of the rail corridor that would be built on a trestle would not require any constructed stormwater drainage features as the rails would be elevated above the ground, leaving the existing ground surface in place.

Since the Stoughton Electric Alternative involves reconstructing inactive portions of the Stoughton Line, this alternative would introduce new potential pollutant sources to some waterbodies and to the groundwater protection areas in proximity to the proposed Stoughton Line. However, with appropriate management, containment, and mitigation measures in place, these sources would not be expected to contribute contaminants that would impair any of the waterbodies or drinking water sources along the line. With proper design of the stormwater management system and regular maintenance of the track and trains, the new rail line and train operations would pose a minimal threat to waterbodies and drinking water supplies.

As described in Section 4.17.3.2, *Impact Assessment Methodology,* the rail corridor would use a combination of drainage ditches alongside the tracks and underdrains installed in the rail ballast to keep the railbed dry and stable. Potential temporary, construction-period impacts to surface and groundwater resources are discussed in Section 4.17.3.4, *Temporary Construction Impacts*. Mitigation proposed to prevent contamination of surface and groundwater resources from the pollutant sources discussed in the section on Potential Pollutant Sources, are discussed in Section 4.17.3.6, *Mitigation*.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative is identical to the Stoughton Electric Alternative with the exception of the locomotive power source. As described previously for the Attleboro Diesel Alternative, diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure but instead generating diesel exhaust and increasing the potential risk of fuel spills. Constructing the Stoughton Diesel Alternative along the Stoughton Line would be identical to the Stoughton Electric Alternative except without the new electrical infrastructure required for that alternative. This alternative would be near the same waterbodies and groundwater protection areas discussed for the Stoughton Electric Alternative.

Due to the use of diesel fuel, the Stoughton Diesel Alternative would likely have a higher rate of hydrocarbon accumulation on the rail ballast than the Stoughton Electric Alternative, and there would be a greater chance of fuel spills. However, aerial deposition of diesel exhaust would not be a significant source of pollution of water resources because of the very low concentrations of pollutants in the vicinity of the track. The regular operations proposed for this alternative would not be expected to contribute contaminants that would impair any of the waterbodies or drinking water sources along the line.

Potential temporary, construction-period impacts to surface and groundwater resources are discussed in Section 4.17.3.4, *Temporary Construction Impacts*. Mitigation proposed to prevent contamination of surface and groundwater resources from the pollutant sources discussed in the section on Potential Pollutant Sources, are discussed in Section 4.17.3.6, *Mitigation*.

Whittenton Electric Alternative

The Whittenton Electric Alternative is a variant of the Stoughton Electric Alternative alignment described previously. Specifically, at Raynham Junction near the southern end of the historic Stoughton

Line, the alignment would divert to the southwest, following the old Whittenton Branch (Figures 4.17-5a-b). This alignment would connect with the Attleboro Secondary at Whittenton Junction in Taunton, and then continue southeast to connect with the New Bedford Main Line at Weir Junction, at the northern end of the Southern Triangle. This evaluation focuses on the Whittenton Branch component only. Service along the southernmost portion of the Stoughton Line, from Raynham Junction to Weir Junction, would not be reestablished if this variant were selected. This alternative would include the following stations: Canton Center, Stoughton, North Easton, Easton Village, Raynham Park, and Dana Street. No layover facilities are planned within this segment.

Table 4.17-17 lists waterbodies near the Whittenton Branch and identifies the waterbodies that would receive stormwater discharges from the rail line. Prospect Hill Pond would receive stormwater discharges. Although the Whittenton Branch would cross the Mill River in Taunton, the river would not receive any stormwater discharges from the proposed drainage system. However, discharges to nearby wetlands and municipal systems may eventually reach the Mill River. No Zone A areas would be affected by the Whittenton Branch.

Table 4.17-17 Stormwater Discharges on the Whittenton Branch

Waterbody	Municipality	ACEC/ORW	Stormwater Discharges Proposed
Mill River	Taunton	No	No
Prospect Hill Pond	Taunton	No	Yes

This alternative would require construction within the groundwater protection zones for all seven of the North Raynham Water District's existing and proposed wells, including the Zone I area for King Philip Street Well #2. (It should be emphasized that this alternative would require work within *all* areas of Raynham's water supply.) No other Zone I areas would be affected, and no electrical substations would be located in any IWPAs, Zone A areas, or Zone I areas. The Zone II areas include numerous residential neighborhoods, but the Zone I area for King Philip Street Well #2 is largely undeveloped. The individual wells, their protection zones, and potential impacts are listed in Table 4.17-18. There would be no stormwater discharges in any Zone I areas, but there would be stormwater discharges in the Zone II area shared by these wells.

Table 4.17-18 Construction and Stormwater Discharges in Public Water Supply Well Protection Areas on the Whittenton Branch

Well	Distance from Proposed Limit of Work (miles)	Water System	Location of Protection Zone Crossings	Construction in Protection Zones	Stormwater Discharges in Protection Zones
Noblin Well Field[1]	0.4	North Raynham Water District (all)	Raynham, Taunton	Zone II	Zone II
First St. Replacement Well	0.6		Raynham, Taunton	Zone II	Zone II
King Philip St. Well #1	0.2		Raynham, Taunton	Zone II	Zone II
King Philip St. Well #2	0.02		Raynham, Taunton	Zone I and Zone II	Zone II
King Philip St. Well #3A	0.7		Raynham	Zone II	Zone II
King Philip St. Well #3B	0.6		Raynham	Zone II	Zone II
King Philip Bedrock Well[1]	0.7		Raynham	Zone II	Zone II

1 Proposed well

The stormwater discharges from the Whittenton Branch would not be expected to contribute contaminants that would impair any waterbodies or water supplies. No new impervious surfaces would be constructed as part of the rail line itself, resulting in no changes in runoff rates. Since the Whittenton Electric Alternative involves reconstructing the inactive Whittenton Branch, this alternative would introduce new potential pollutant sources to some waterbodies and to the groundwater protection areas adjacent to the Whittenton Branch. However, with appropriate management, containment, and mitigation measures in place, these sources would not be expected to contribute contaminants that would impair any of the waterbodies or drinking water sources along the line.

With proper design of the stormwater management system and regular maintenance of the track and trains, the new rail line and train operations would pose a minimal threat to waterbodies and drinking water supplies.

As described in Section 4.17.3.2, *Impact Assessment Methodology*, the rail corridor would use a combination of drainage ditches alongside the tracks and underdrains installed in the rail ballast to keep the railbed dry and stable. Potential temporary, construction-period impacts to surface and groundwater resources are discussed in Section 4.17.3.4, *Temporary Construction Impacts*. Mitigation proposed to prevent contamination of surface and groundwater resources from the pollutant sources discussed in the section on Potential Pollutant Sources, are discussed in Section 4.17.3.6, *Mitigation*.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. As described above for the Attleboro Diesel Alternative, diesel-powered train service differs from electric-powered service in not requiring electrical infrastructure but instead generating diesel exhaust and increasing the potential risk of fuel spills. Constructing the Whittenton Diesel Alternative would be identical to the Whittenton Electric Alternative except without the new electrical infrastructure required for that alternative. This alternative would be near the same waterbodies and groundwater protection areas discussed for the Whittenton Electric Alternative.

Due to the use of diesel fuel, the Whittenton Diesel Alternative would likely have a higher rate of hydrocarbon accumulation on the rail ballast than the Whittenton Electric Alternative, and there would be a greater chance of fuel spills. However, aerial deposition of diesel exhaust would not be a significant source of pollution of water resources because of the very low concentrations of pollutants in the vicinity of the track. The regular operations proposed for this alternative would not be expected to contribute contaminants that would impair any of the waterbodies or drinking water sources along the line.

Potential temporary, construction-period impacts to surface and groundwater resources are discussed in Section 4.17.3.4, *Temporary Construction Impacts*. Mitigation proposed to prevent contamination of surface and groundwater resources from the pollutant sources discussed in the section on Potential Pollutant Sources, are discussed in Section 4.17.3.6, *Mitigation*.

Hockomock Swamp Trestle

In order to avoid and minimize impacts to the Hockomock Swamp, a 1.6 mile (8,500 foot) section of track would be constructed on an elevated trestle between Foundry Street and Raynham Station. The trestle would consist of pile bents spaced at 50 foot intervals, with concrete spans supporting a ballasted rail bed and a walkway for railroad maintenance personnel. Drainage from this structure

would be managed in place through the use of infiltration trenches located at intervals beneath the trestle (Figures 4.17-10 thru 12). The remainder of this section describes the drainage design of the trestle and the proposed infiltration trenches.

Trestle Drainage

The trestle would consist of concrete and steel spans that supports a railbed consisting ballast, ties, and track. The ballast would be drained by a 6 inch underdrain (HDPE perforated pipe) that would be laid parallel to the track. The floor of the trestle would be sloped to direct water to the underdrain. In turn, the underdrain would be connected to downspouts located every 300 feet along the length of the trestle. These downspouts would carry runoff to infiltration trenches located beneath the trestle. Runoff directed to the infiltration trenches would infiltrate into the subsurface soils of the existing **railroad** embankment. During large storm events, runoff would also discharge down the slope of the embankment and into wetlands associated with the adjacent Hockomock Swamp.

The proposed infiltration trenches would each be 16 feet wide by 33 feet long. The length of the trenches is constrained by the spacing of the pile bents and the 5 foot setback that is required from each pile bent. The trenches are sized to provide the recharge volume and the 0.5 inch water quality volume. The floor of each trench would be lined with 6 inches of stone to prevent scour and would have a 4-foot long level spreader to act as an overflow weir. Approximately 30 infiltration trenches would be required along the length of the trestle to provide stormwater management for the structure.

Stormwater Analysis

A HydroCAD[14] analysis was performed to evaluate the storage volume of the ballast on the trestle as well as within the infiltration trench. The results of this analysis demonstrate that the peak rate control is met for the 2, 10, and 100 year storm events.

The recharge volume required for the unit discharge area was calculated to be 127 cubic feet. Each infiltration trench provides 254 cubic feet of recharge volume below the lowest outlet. An overflow weir is incorporated into each infiltration trench to safely dissipate flow from large storm events and prevent scour. During the 100 year storm event, peak flows are anticipated to remain less than 1 cfs, indicating that runoff would be captured and released at non-erosive rates[15] even during large storm events. Existing and proposed discharge rates for the Unit Discharge infiltration trench are shown for the 2, 10, and 100 year storm events in Table 4.17-19.

Table 4.17-19 Peak Discharge Rates (cfs[1])–Hockomock Swamp Trestle Unit Discharge

Design Point	2-year	10-year	100-year
Design Point: Wetland			
Existing	0.12	0.28	0.56
Proposed	0.05	0.14	0.26

1 cubic feet per second

[14] HydroCAD Software Solutions LLC. HydroCAD Stormwater Modeling System, Version 7, Owner's Manual. Chocorua, New Hampshire. 2004.

[15] The Massachusetts Stormwater Handbook defines a non-erosive flow velocity for drainage channels to be generally less than five feet per second.

Massachusetts Stormwater Standard 4 specifies that "Stormwater Management Systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS)." As previously noted, rail operations generate negligible quantities of TSS. Because the trestle consists of ballast placed inside a solid structure, stormwater runoff must be managed differently than that from ballast placed directly on the ground; however the TSS loading would be similarly negligible. Each infiltration trench has been designed to meet the 0.5 inch Water Quality Volume for its contributing drainage area. Because of the trestle's configuration and setting, it is not feasible to provide the full 1 inch Water Quality Volume and the 44 percent pretreatment required to receive credit for 80 percent TSS removal under the guidelines contained in the Stormwater Handbook. However, discharges from the trestle can be considered *de minimis* under the guidance provided in Volume 3, Chapter 1 of the Handbook. The Handbook specifies the following criteria for a *de minimis* determination:

- Physical site conditions preclude installation of a TSS treatment practice.
- The discharge is less than or equal to 1 cfs for runoff associated with the 2 year, 24 hour storm.
- 80 percent TSS removal is achieved on an average weighted basis from the site as a whole using the weighted average method.
- The stormwater outlets where additional controls are used to achieve more than 80 percent TSS removal must discharge to the same reach of the same wetland or waterbody as the outlets that achieve less than 80 percent TSS removal.
- Controls are placed at the outlet to prevent erosion or scour of the wetland/stream channel and bank.
- Standard 2 and Standard 3 must be achieved on a site-wide basis.
- Source control and pollution prevention measures that mitigate the impact of the untreated or partially treated discharges are identified in the Pollution Prevention Plan.
- The size of the drainage area contributing runoff to the untreated outlet has been reduced to the maximum extent practicable.

Compliance with Massachusetts Stormwater Standards

The Hockomock Swamp Trestle has been designed to comply fully with all ten of the Stormwater Standards. Compliance documentation is included in the Hockomock Swamp Stormwater Report (Appendix 4.17-A) and summarized in Table 4.17-20.

Table 4.17-20 Massachusetts Stormwater Standards Compliance[16]–Hockomock Swamp Trestle

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. BMPs are proposed to treat stormwater runoff from the site and outlets and conveyances are protected from erosion.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. Peak discharges rates at the design point are expected to be reduced between 0.08 and 0.30 cfs for the range of storm events analyzed.
Standard3: Stormwater Recharge	Full compliance would be achieved. 254 cubic feet of recharge volume is provided within each infiltration trench, exceeding the required recharge volume of 127 cubic feet per unit discharge area.
Standard 4: Water Quality	Full compliance would be achieved. The trestle drainage system meets the *de minimis* requirements for WQV and TSS removal.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The trestle does not meet any of the criteria of a LUHPPL.
Standard 6: Critical Areas	Full compliance would be achieved. The site discharges to wetlands within the Hockomock Swamp ACEC, a stormwater critical area.
Standard 7: Redevelopment Standards	Not applicable. This site is not a redevelopment.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. Storm drainage structures remaining from the previous development which are part of the redevelopment area would be removed. The proposed station has been designed so that the components included therein are in full compliance with current standards. No statement is made with regard to the drainage system in portions of the site not included in the redevelopment project area.

Stations

This section describes each train station, indicates its location near any notable surface or groundwater resources, and evaluates the potential direct and indirect impacts to water resources that could result from the construction and operation of each station for the South Coast Rail project. The section includes a discussion of the design elements of the proposed railroad stations that relate to stormwater management and describes the results of the stormwater analyses and potential mitigation measures, as required by the Secretary's Certificate. The Massachusetts Stormwater Standards (the Stormwater Standards) provide a framework for evaluating the impacts of development activities and identifies mitigation measures that are required to offset those impacts. Twelve stations would be constructed or modified as part of the South Coast Rail project. Modifications are proposed at two existing stations

[16] www.mass.gov/dep/water/laws

(Canton Center and Stoughton). The modifications at the Canton Center Station are limited to the construction of a new Americans with Disabilities Act (ADA)-compliant platform and canopy and do not involve the construction of additional impervious area. The existing Stoughton Station would be removed and replaced with a new station at a different location.

New platform-only stations would be constructed at the Easton Village, King's Highway, Whale's Tooth, and Battleship Cove sites. These locations are developed sites with existing parking facilities (King's Highway and Whale's Tooth) or are drop-off facilities without on-site parking (Easton Village, Battleship Cove).

The Fall River Depot Station would be constructed on the site of the former railroad station and would include a structured parking facility that would maintain existing drainage patterns at the site.

The newly constructed stations would discharge stormwater runoff to wetlands and would require compliance with the Stormwater Standards. Two of these stations (Taunton and Raynham Park) would be located on previously developed sites that meet the redevelopment criteria under Standard 7 of the Stormwater Standards. Three stations (North Easton, Taunton Depot, and Freetown) would be located on undeveloped sites that would require full compliance with the Stormwater Standards.

For the hydrologic analysis, each of the five analyzed station sites was divided into one or more drainage areas that contribute runoff to one or more design points. Peak discharge rates were evaluated at these design points under pre- and post-development conditions in order to demonstrate compliance with the Stormwater Standards.

The rainfall-runoff response of each site under existing and proposed conditions was evaluated for storm events with recurrence intervals of 2, 10, and 100 years. Rainfall depths used for this analysis were based on the Natural Resources Conservation Service (NRCS) Type III, 24-hour storm event; they were 3.4, 4.8, and 7.0 inches, respectively. Curve numbers for the pre- and post-development conditions were determined using NRCS TR 55 methodology[17] as provided in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR 20) Model for Project Formulation Hydrology. Detailed printouts of the HydroCAD analyses are included in stormwater reports for individual station sites and are provided in Appendix 4.17-B. Drainage areas used in the analyses are summarized below and are fully described in the individual station stormwater reports. A summary of the existing and proposed conditions peak discharge rates is included for each station site.

The closed drainage system for each station was designed for the 25-year storm event, in accordance with the MBTA's requirements. Drainage pipes were sized using Manning's Equation[18] for full-flow capacity and the Rational Method. Additionally, the performance of the system was analyzed using StormCAD,[19] a HEC-22[20] based program. Pipe sizing calculations are included in the individual station stormwater reports provided in Appendix 4.17-B.

[17] US Department of Agriculture Natural Resources Conservation Service Conservation Engineering Division. 1986. Urban Hydrology for Small Watersheds, Technical Release 55

[18] The Mannings equation is an empirical equation that applies to uniform flow in open channels and is a function of the channel velocity, flow area and channel slope.

[19] StormCAD software provides comprehensive modeling for the design and analysis of storm sewer systems. See http://www.bentley.com/en-US/Products/StormCAD/

[20] Hydraulic Engineering Circular 22 Urban Drainage Design Manual FHWA-NHI-10-009

Soil characteristics for the five station sites were assessed according to the National Cooperative Soil Survey (NCSS)[21] and the NRCS. Individual geotechnical investigations were con**d**ucted for each station site. Soil conditions were found to vary considerably between sites, with some sites providing excellent opportunities allow stormwater to infiltrate into the ground and others providing limited to no opportunities for infiltration as the groundwater was already at or near the base of the proposed stormwater BMP. In accordance with the Stormwater Standards identified in Table 4.17-20, above, soil infiltration capacity was evaluated according to the 1982 Rawls Rates.[22] Depth to groundwater was evaluated for each location where infiltration BMPs were proposed in order to confirm that there was sufficient separation from seasonal high groundwater. Lined filtration BMPs were proposed for locations where it was not feasible to achieve the required 2 feet of separation from seasonal high groundwater. Geotechnical reports for each station site are included in the individual station stormwater reports provided in Appendix 4.17-B.

The latest FEMA Flood Insurance Rate Maps (FIRMs) were reviewed for each station site in order to evaluate for potential impacts within the 100 year floodplain. According to the latest maps available from FEMA, none of the station sites are within the 100 year floodplain. A copy of the latest FIRM for each station site is included in the station stormwater reports provided in Appendix 4.17-B.

The Secretary's Certificate on the DEIR and the Stormwater Regulations at 310 CMR 10.05(6)(k) require MassDOT to consider Environmentally Sensitive Site Design (ESSD) and Low Impact Development (LID) design practices. Between the constraints of the essentially fixed elevations of the rail bed and site access road(s), the proposed topography at each station site matches the existing topography to the extent practicable and existing drainage patterns would be maintained. Where necessary, retaining walls were used to minimize impact to wetlands or other sensitive areas. Existing mature vegetation would be preserved and unnecessary impervious areas would be removed. Runoff from existing and proposed impervious areas is disconnected where possible and directed to LID features such as filter strips, grassed swales, and bioretention basins. Infiltration basins were incorporated wherever possible to mimic natural hydrology and to improve groundwater recharge. Structured parking (parking garages) was evaluated as an alternative to at-grade parking in order to reduce the potential area of impervious cover at each station.

The following non-structural water quantity and quality control BMPs to be implemented at station sites:

- **Snow Management:** No snow would be placed in, or directly adjacent to wetland resource areas. As much as possible snow would be allowed to melt on pavement where debris and sand may be deposited and swept up for disposal. Snow melt would enter the stormwater management system where it would receive proper treatment.

- **Spill Prevention:** Spill prevention is achieved with the proper storage and handling of hazardous materials. During construction, this is addressed in the Stormwater Pollution

[21] The National Cooperative Soil Survey (NCSS) is a nationwide partnership of federal, regional, state and local agencies; and private entities and institutions. This partnership works together to cooperatively investigate, inventory, document, classify, interpret, disseminate, and publish information about soils of the United States. NCSS standards are common or shared procedures that enhance technology transfer, data sharing, and communications among soil survey participants.

[22] Rawls, Brakensiek and Saxton, 1982, Estimation of Soil Water Properties, Transactions American Society of Agricultural Engineers 25(5): 1316 - 1320, 1328

Prevention Plan (SWPPP) for Construction Activities that would be prepared prior to the start of construction activities.

- **Source Control:** A comprehensive source control program would be implemented at each station site, which includes regular pavement sweeping, catch basin cleaning, and enclosure and maintenance of all dumpsters, compactors, and loading areas. MBTA would develop a detailed Operations and Maintenance Plan (O&M Plan) during the final design phase of the project and would include it with the Notice of Intent submittal. This plan would address specific maintenance measures that must be performed and the required frequency in order to maintain the stormwater management measures at each station site.

The following structural water quantity and quality control BMPs to be implemented at station sites. Not all BMPs are suitable for each station site.

- **Catch Basins with Sumps and Oil/Debris Traps:** Catch basins at station sites are to be constructed with sumps (minimum 4 feet) and oil/debris traps to prevent the discharge of sediments and floating contaminants. Catch basins must be cleaned regularly to remove accumulated debris and maintain functionality. Catch basins would be inspected and cleaned according to the maintenance schedule laid out in the O&M Plan.

- **Oil/Grit Separator:** MADEP requires the use of a pretreatment BMP, such as an oil/grit separator for sites that constitute land uses with higher potential pollutant loads (LUHPPLs). These structures are underground storage tanks consisting of three chambers that are separated by interior baffle walls. The placement of the interior baffles and the outlet from the structure are designed to remove heavy particulates, floating debris and hydrocarbons from stormwater. Oil/grit separators must be cleaned regularly to remove accumulated debris and maintain functionality. Oil/grit separators would be inspected and cleaned according to the maintenance schedule laid out in the O&M Plan.

- **Vegetated (Grass & Gravel) Filter Strip:** A vegetated or grass filter strip is a linear stormwater management measure that is generally oriented parallel to the contributing drainage area and treats sheet flow or small quantities of concentrated flows that can be distributed along the width of the filter strip. A level spreader, consisting of a pea gravel diaphragm or other similar feature, runs the width of the area being treated. The level spread intercepts and dissipates runoff to minimize the risk of erosion due to concentrated flows. Vegetated filter strips are maintained (mowed) in conjunction with standard site landscape maintenance. Periodic inspections of filter strip are required to confirm that the pea gravel diaphragm has not clogged and that filter strip does not have areas of erosion or bare soil. Additional guidance for filter strip inspection and maintenance requirements would be provided in the O&M Plan.

- **Vegetated (Grass) Swales:** Vegetated swales provide some treatment, reduction, and distribution of stormwater during conveyance. Pollutant removal mechanisms include filtering by the swale vegetation (both on side slopes and on bottom), filtering through a subsoil matrix, and/or infiltration into the underlying soils. Trash removal and vegetation management are required in conjunction with standard landscape maintenance. Additional guidance for vegetated swale inspection and maintenance requirements would be provided in the O&M Plan.

- **Bioretention Swales:** Bioretention swales provide enhanced treatment and infiltration capacity with a conditioned soil mix, mulch layer, and an increased planting density in the conveyance swale. Trash removal and vegetation management are required in conjunction with standard landscape maintenance. Additional guidance for bioretention swale inspection and maintenance requirements would be provided in the O&M Plan.

- **Bioretention Basins:** A bioretention basin manages and treats stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression. The system consists of a flow regulation structure, a pretreatment filter strip or vegetated swale, a sand bed, a shallow ponding area, a surface organic layer of mulch, a planting soil bed, plant material, a gravel underdrain system (if required), and an overflow drain. The vegetation in a bioretention basin serves to filter and transpire runoff—improving water quality and reducing runoff quantity—and the root systems can enhance infiltration. The soil medium filters out pollutants and allows storage and infiltration of stormwater runoff; and the infiltration bed provides additional volume control. Trash removal and vegetation management are required in conjunction with standard landscape maintenance. A bioretention basin should also be inspected periodically during the first year and annually thereafter for sediment buildup, erosion, vegetative conditions. Additional guidance for bioretention basin inspection and maintenance requirements would be provided in the O&M Plan.

- **Infiltration Basin:** Infiltration basins are stormwater runoff impoundments that are constructed in areas with permeable soils. Pretreatment of runoff is critical to prevent the basin from becoming clogged with fine sediment and suffering premature failure. Runoff from the design storm is stored until it exfiltrates through the soil of the basin floor. Trash removal and vegetation management are required in conjunction with standard landscape maintenance. Periodic inspections are required to ensure that the basin drains within 72 hours of the design storm event. If the basin is not draining adequately, a layer of sediment may need to be removed from the floor of the basin to restore infiltration capacity. Additional guidance for infiltration basin inspection and maintenance requirements would be provided in the O&M Plan.

- **Porous Pavement:** Porous pavement is constructed with a base and subbase that allows stormwater to infiltrate through it thereby reducing runoff volume. MassDOT considered permeable pavement but determined that this is not a feasible surface finish because of the lack of ability to maintain the surface and because the amount of sand and salt that would be used during winter operations would clog the system. The MBTA does not currently use porous pavement for these reasons.

Any new or redeveloped station that would increase impervious area at the site would likely require a new or upgraded stormwater management system to prevent flooding or water quality impacts from the construction and operation of the stations. The following section provides a description as measures proposed (if necessary) to comply with MADEP stormwater standards.

Canton Center Station

Canton Center Station is an existing station located in Canton, Massachusetts on the Stoughton Line. The site is fully developed with the existing commuter rail station, a 219 car parking lot, and ancillary

structures. The surrounding parcels are fully developed with commercial and industrial uses. Improvements would be limited to construction of a new canopy and platform, and does not involve the construction of additional impervious area. The conceptual design for Canton Center Station is shown on Figure 4.17-13.

Given the current active status of the Canton Center station in a developed area of Canton, the reconstruction of this station would have no impacts to surface or groundwater resources. No stormwater analysis was conducted for Canton Center Station because improvements at the station result in a negligible increase in impervious area. The station is within the Neponset River watershed which has an approved TMDL for bacteria. It is not anticipated that the proposed relocated platform at Canton Center would increase bacteria loads in the watershed.

Stoughton Station

The existing Stoughton Station would be relocated as part of the South Coast Rail project to eliminate conflicts with traffic in Stoughton Center and to meet regulatory requirements for access. Relocating the station would also support downtown revitalization efforts. The existing Stoughton Station is currently the terminal station on the Stoughton Branch of the MBTA commuter rail service. At the current station location, stopped trains block the nearby Wyman Street at-grade crossing while passengers board and alight the train. The low-level platforms of the current station do not meet Americans with Disabilities Act (ADA) accessibility requirements and must be replaced by a high-level platform.

As described in Chapter 3, four location options were reviewed by MassDOT operations and accessibility departments to select a station location and configuration that meets operational and regulatory requirements and provides benefits to the community at a reasonable cost. Option 3 was selected as the Preferred Alternative. This option would realign the tracks and relocate the station between Morton Street and Brock Street with high level platforms and parking on the west side of the tracks (Figure 4.17-24). It has two means of crossing the tracks (a pedestrian bridge and an at-grade crossing). Approximately 2.5 acres of the existing MBTA station parking lot land east of the tracks would be opened for potential development. It would require acquisition of up to 0.2 acres of residential and 9.6 acres of industrial or commercial properties.

As shown in Figure 4.17-14, the footprint of the relocated Stoughton Station and realigned tracks would comprise approximately 7.5 acres. The station would have ADA compliant platforms (with canopies) on either side of the realigned double tracks, with a pedestrian bridge over the tracks connecting the two platforms. Car parking would be provided on the west side of the tracks; a total of 642 spaces are proposed, comprised of 619 standard spaces, 17 accessible spaces, and 6 drop-off spaces. The entrance to the parking lot would be on the south side, off of Brock Street. Approximately 3.3 acres of new impervious surface would be created; added to the existing 2 acres of impervious surface, there would be a total of 5.3 acres of impervious surface at the relocated station site. The parking lot would be configured to avoid any on-site jurisdictional wetlands. The realigned tracks, new platforms, and new parking lot would occupy land currently used for industrial and commercial purposes; these businesses would be displaced. Land east of the realigned tracks, currently occupied by the existing track alignment and parking areas, would be available for redevelopment.

The station is within the Neponset River watershed which has an approved TMDL for bacteria in the watershed. It is not anticipated that the proposed relocated Stoughton Station would increase bacteria loads in the watershed.

The station would be designed in compliance with Massachusetts Stormwater Standards, using appropriate BMPs to maintain groundwater recharge and reduce the discharge of pollutants. No further stormwater analysis has been completed at this time.

North Easton Station

North Easton Station would be a new station located on the Stoughton Line and would be constructed on an approximately 10.0-acre site in Stoughton and Easton, Massachusetts. The site is bounded by undeveloped land to the north, a wetland to the south, office buildings to the east, and the out-of-service Stoughton Line tracks to the west (Figure 4.17-15a).

Station Description—North Easton Station would include a center platform with canopy, a parking lot with 506 spaces, access driveway, bus drop-off area, sidewalks, stairs and ramps associated with access from the parking lot to the platform, bicycle parking facilities, retaining walls and stormwater infrastructure. Construction of the station would involve clearing and grubbing wooded portions of the site and removing a small paved area that currently exists on the site. Construction of the station and associated parking facility would result in a net increase of approximately 1.8 acres of impervious area. The conceptual design for North Easton Station is shown on Figure 4.17-15b.

Wetland areas are located both north and south of the site, but the limits of work would not affect any waterbodies or drinking water protection areas. Whitman Brook, a certified vernal pool (CVP), and the Zone II area for Easton GP Wells #1, #2, and #4 are located nearby but would not be affected by the station site.

Since the site is largely undeveloped, the addition of parking and the station structures would require a new stormwater management system. A stormwater management area would be provided at the south end of the site to manage stormwater flows, reduce flooding, and remove settleable solids. The stormwater management system would discharge to the wetlands adjacent to the site outside of the Zone II area for the Easton wells. With a proper stormwater management design for the station site, there would be no impacts to surface or groundwater resources such as Whitman Brook, the CVP, or the Zone II.

Stormwater Analysis—For the North Easton Station site, three separate design points were identified and the contributing drainage areas to each were evaluated under existing and proposed conditions. Peak flow reductions were achieved for all storm events through the use of LID techniques and stormwater BMPs. These practices include minimizing disturbance to existing trees and vegetation, infiltration basins, bioretention basins, grassed swales, oil/grit separators, and the use of light colored pavement for sidewalks. The BMPs were sized to manage the water quality volume and recharge volume requirements identified under the Stormwater Standards. The station is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed improvements at the site would increase bacteria loads in the watershed.

The proposed drainage areas for North Easton Station are shown on Figure 4.17-15b. Stormwater runoff from the northern portion of the site sheet flows off of the impervious surface and is conveyed via a grassed swale to Bioretention Basin 1. Bioretention Basin 1 drains to Wetland ST-10. Stormwater runoff from the southern portion of the site is collected in deep sump hooded catch basins, travels through the closed drainage system, passes through an oil/ grit separator prior to discharging to sediment forebays, and is ultimately discharged to Infiltration Basins 2, 3, 4, and 5. These infiltration basins drain to Wetland EA 1. Wooded areas in the northern portion of the property would be maintained in their existing

conditions as much as possible. Existing and proposed peak discharge rates to each of the design points for the 2, 10, and 100 year storm events are shown in Table 4.17-21.

Table 4.17-21 Peak Discharge Rates (cfs[1])–North Easton Station

Design Point	2-year	10-year	100-year
Design Point 1: Wetland ST-10			
Existing	1.1	2.6	5.5
Proposed	1.0	2.2	4.3
Design Point 3: Wetland EA-1			
Existing	1.2	3.3	9.0
Proposed	0.8	2.8	7.8
Design Point 4: Wetland EA-1			
Existing	1.3	2.2	3.8
Proposed	1.0	1.8	3.0

1 cubic feet per second

Compliance with Massachusetts Stormwater Standards—North Easton Station has been designed to comply fully with all ten of the Stormwater Standards. Compliance documentation is included in the North Easton Station Stormwater Report (Appendix 4.17-B) and summarized in Table 4.17-22.

Table 4.17-22 Massachusetts Stormwater Standards Compliance–North Easton Station

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. BMPs are proposed to treat stormwater runoff from the site and outlets and conveyances are protected from erosion.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. Peak discharges rates at each design point are expected to be reduced between 0 and 1.4 cfs for the range of storm events analyzed.
Standard3: Stormwater Recharge	Full compliance would be achieved. The required recharge volume of 6,926 cubic feet is provided in three infiltration basins and a bioretention basin that provide a total of 55,745 cubic feet of recharge.
Standard 4: Water Quality	Full compliance would be achieved. Eighty percent total suspended solids (TSS) removal is achieved for all drainage areas with contributions from impervious surfaces and 44% pretreatment is also provided prior to infiltration BMPs.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The station is considered a LUHPPL because it has greater than 500 parking spaces. BMPs have been sized to treat the 1-inch Water Quality Volume and provide 44% pretreatment of TSS prior to infiltration.
Standard 6: Critical Areas	Full compliance would be achieved. The site does not discharge near or to a stormwater critical area.
Standard 7: Redevelopment Standards	Full compliance would be achieved. The site has been designed to fully comply would all ten Stormwater Standards.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. The site was previously undeveloped and no sanitary sewer or storm drainage infrastructure is known to exist on the site. The proposed station has been designed in full compliance with current standards.

Easton Village Station

Easton Village Station would be a new platform-only station located adjacent to the historic Old Colony Railroad Station in North Easton, Massachusetts. The station site is adjacent to the existing paved parking area serving the adjacent Easton Historical Society (housed in the historic station building) and is within the existing ballasted right-of-way (Figure 4.17-16).

Station Description—Easton Village Station would include a side platform with canopy, ancillary landscape improvements, bicycle parking facilities, and utility improvements. No additional parking

spaces would be added, however a second driveway would be added to improve traffic circulation. The conceptual design for Easton Village Station is shown on Figure 4.17-16.

This 0.5 acre site is located on Sullivan Avenue at the transition point to Mechanic Street (near the intersection with Pond Street) in Easton, within walking distance of downtown Easton. The station would be village-style and serve walk-in or bike-in customers. The station includes only 10 parking spaces, which are designated for pick up/drop off only.

The station would be located near Shovelshop Pond and Queset Brook. While the limit of work for the station would not affect Shovelshop Pond, Queset Brook passes beneath the track and platform at the southern end of the station. The station is located within the Zone II area for Easton GP Wells #1, #2, and #4, which are operated by the Easton Water Division. Stormwater from the parking lot would flow to Sullivan Street and would be discharged to Shovelshop Pond. The station would have negligible effects on groundwater recharge and groundwater quality, due to the existing development in this area, the minimal increase in impervious area, and the lack of pollutant sources at the station itself, which is only a platform with minimal parking. Groundwater impacts are not anticipated, and, with proper design of the station, there would be no impacts to surface or groundwater resources, including Shovelshop Pond.

Stormwater Analysis—No stormwater analysis was conducted for Easton Village Station because improvements at the station result in a negligible increase in impervious area. The station is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed improvements at the site would increase bacteria loads in the watershed.

Compliance with Massachusetts Stormwater Standards—Improvements at the Easton Village Station result in a negligible increase in impervious area and would be designed to comply with all ten of the Stormwater Standards to the maximum extent practicable.

Raynham Park Station

Raynham Park Station would be a new station located on the Stoughton Line and would be constructed on an 11.4 acre site south of the former Raynham Park Greyhound Track in Raynham, Massachusetts (Figure 4.17-17a). The site consists almost entirely of previously developed land and is bounded to the north by the former Raynham Park Greyhound Track, to the south by industrial buildings, to the east by Route 138, and the Stoughton Line right-of-way and the Hockomock Swamp Area of Critical Environmental Concern (ACEC) to the west. Drainage from the site discharges to the Hockomock Swamp ACEC, either directly through surface channels or through the closed drainage system of the adjacent parking lot.

Station Description—Raynham Park Station would include a center platform with canopy, ancillary landscape improvements, a parking lot with 432 spaces, bicycle parking facilities, and utility improvements. Construction of the station would involve demolishing abandoned kennels and several small buildings currently on the site. Improvements at the site would reduce impervious area by 0.5 acres. The conceptual design for Raynham Park Station is shown on Figure 4.17-17a.

The limits of work would not affect any waterbodies or drinking water protection areas. The proposed station layout includes a subsurface detention and infiltration system to manage stormwater flows, reduce flooding, and remove settleable solids. The stormwater system would discharge to an unnamed perennial stream within the Hockomock Swamp ACEC. The use of an infiltration-based system would

provide a high level of settling and filtration of any contaminants. With a proper stormwater management design for the station site, there would be no impacts to surface or groundwater resources, including the Hockomock Swamp.

Stormwater Analysis—For the Raynham Park Station site, four separate design points were identified and the contributing drainage areas to each were evaluated under existing and proposed conditions. Peak flow reductions were achieved for all storm events through the reduction of impervious area and the use of LID techniques and stormwater BMPs such as gravel and grass filter strips, grassed channels, bioretention basins, and a bioretention swale. The BMPs were sized to manage the water quality volume and recharge volume requirements identified under the Stormwater Standards. The station is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed improvements at the site would increase bacteria loads in the watershed.

The proposed drainage areas for Raynham Park Station are shown on Figure 4.17-17b. Stormwater runoff from the northeastern portion of the site sheet flows off of the impervious surface and is conveyed via two grassed swales to Bioretention Basin 1. Overflows from this basin are discharged to the existing paved parking areas farther north and are captured by the existing closed drainage system in this portion of the site, as under existing conditions. Runoff from the landscaped area at the southeast portion of the site would sheet flow to Wetland R5. Runoff from the northwest portion of the site would be collected in a new closed drainage system that would discharge to Bioretention Basin 3. Overflows from this basin are discharged to the existing paved parking areas farther north and are captured by the existing closed drainage system in this portion of the site, as under existing conditions. The southwest portion of the site is drained by sheet flow to a gravel and grass filter strip and into a bioretention swale before discharging to an unnamed perennial stream west of the rail line. This stream flows north into the Hockomock Swamp ACEC. Existing and proposed peak discharge rates to each of the design points for the 2, 10, and 100 year storm events are shown in Table 4.17-23.

Compliance with Massachusetts Stormwater Standards—Raynham Park Station has been designed to comply fully with all ten of the Stormwater Standards. Compliance documentation is included in the Raynham Park Station Stormwater Report (Appendix 4.17-B) and summarized in Table 4.17-24.

Table 4.17-23 Peak Discharge Rates (cfs[1])–Raynham Park Station

Design Point	2-year	10-year	100-year
Design Point 1: Adjacent Parking Area			
Existing	21.8	31.1	45.7
Proposed	16.9	27.6	41.0
Design Point 2: Wetland R5			
Existing	5.3	7.8	11.6
Proposed	3.1	5.5	9.5
Design Point 3: Adjacent Parking Area/Drainage System			
Existing	15.8	23.2	34.7
Proposed	12.1	18.4	28.1
Design Point 4: Wetland R62.1			
Existing	7.4	11.6	18.0
Proposed	4.9	9.6	15.8

1 cubic feet per second

Table 4.17-24 Stormwater Standards Compliance–Raynham Park Station

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. BMPs are proposed to treat stormwater runoff from the site and outlets and conveyances are protected from erosion.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. Peak discharges rates at each design point are expected to be reduced between 0.5 and 9.3 cfs for the range of storm events analyzed.
Standard3: Stormwater Recharge	Full compliance would be achieved. The required recharge volume of 5,289 cubic feet is managed within one of the bioretention areas.
Standard 4: Water Quality	Full compliance would be achieved. Ninety percent TSS removal is achieved for all drainage areas with contributions from impervious surfaces.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The station does not qualify as a LUHPPL because it has fewer than 500 parking spaces and does not reach the 1,000 vehicle trip per day threshold.
Standard 6: Critical Areas	Full compliance would be achieved. Because of the proximity to the Hockomock Swamp ACEC, BMPs on the site have been designed to treat the 1-inch water quality volume and meet the 44% pretreatment criteria for infiltration practices.
Standard 7: Redevelopment Standards	Full compliance would be achieved. Although this site constitutes redevelopment, it would fully comply with all ten Stormwater Standards.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. Storm drainage structures remaining from the previous development which are part of the redevelopment area would be removed. The proposed station has been designed so that the components included therein are in full compliance with current standards. No statement is made with regard to the drainage system in portions of the site not included in the redevelopment project area.

Taunton Station

Taunton Station would be a new station constructed on an 11.9 acre brownfield site located at the intersection of East Arlington Street and William Hooke Lane in Taunton, Massachusetts near the Taunton River (Figure 4.17-18a). The site is bounded by undeveloped land to the north, Arlington Street to the south, a wetland to the west, and an active segment of Stoughton Line tracks to the east. The remnant development at the site consists of building foundations and paved driveways left after the previous structures on the site burned down.

Station Description—Taunton Station would include a side platform with canopy, a parking lot with 210 spaces, access driveway, bus drop off area, sidewalks, stairs and ramps associated with access from the parking lot to the train platform, bicycle parking facilities, and a bioretention basin. Ancillary landscape improvements would be made across the site, including the removal of the existing concrete building pads and existing broken pavement. Improvements at the station site would reduce impervious area by 2.8 acres. The conceptual station design for Taunton Station is shown on Figure 4.17-18a.

The limits of work would not affect any waterbodies or drinking water protection areas. An unnamed stream flows through a wetland west of the site and the Taunton River to southeast of the site, but neither is within the limits of work. Given that the site is a previously-developed brownfield site, its redevelopment would be expected to reduce the potential for stormwater and groundwater pollution by removing or remediating existing contamination. With proper handling of existing contamination and a thorough stormwater management design, there would be no adverse impacts to the stream or any other surface or groundwater resources.

Stormwater Analysis—For the Taunton Station site, a single design point was identified and the contributing drainage areas to this design point were evaluated under existing and proposed conditions. Peak flow reductions were achieved for all storm events through the reduction of impervious area and the use of LID techniques and stormwater BMPs such as a grassed channels and bioretention basin. These BMPs were sized to manage the water quality volume and recharge volume requirements identified under the Stormwater Standards. The site is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed commuter rail station would increase bacteria loads in the watershed.

The proposed drainage areas for Taunton Station are shown on Figure 4.17-18b. Under existing conditions, stormwater sheet flows untreated from impervious surfaces to Wetland T41. Stormwater from the proposed impervious surfaces would sheet flow into a grassed swale and then be conveyed to Bioretention Basin 1 for treatment. Discharge from this basin and from vegetated portions of the site would flow to Wetland T41. A significant reduction in impervious area would decrease runoff and increase recharge from the site. Existing and proposed peak discharge rates to the design point are shown for the 2, 10, and 100 year storm events in Table 4.17-25.

Table 4.17-25 Peak Discharge Rates (cfs[1])–Taunton Station

Design Point	2-year	10-year	100-year
Design Point: Wetland T41			
Existing	19.1	28.4	42.8
Proposed	13.9	23.0	37.1

1 cubic feet per second

Compliance with Massachusetts Stormwater Standards—Taunton Station has been designed to comply fully with all ten of the Stormwater Standards. Compliance documentation is included in the Taunton Station Stormwater Report (Appendix 4.17-B) and summarized in Table 4.17-26.

Table 4.17-26 Stormwater Standards Compliance–Taunton Station

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. BMPs are proposed to treat stormwater runoff from the site and outlets and conveyances are protected from erosion.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. Peak discharges rates at the design point are expected to be reduced between 5.2 and 5.7 cfs for the range of storm events analyzed.
Standard3: Stormwater Recharge	Full compliance would be achieved. 1,263 cubic feet of recharge volume is provided within the bioretention area, exceeding the required recharge volume of 970 cubic feet.
Standard 4: Water Quality	Full compliance would be achieved. Ninety percent TSS removal is achieved for all drainage areas with contributions from impervious surfaces.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The station does not qualify as a LUHPPL because it has fewer than 500 parking spaces and does not reach the 1,000 vehicle trip per day threshold.
Standard 6: Critical Areas	Full compliance would be achieved. The site does not discharge near or to a critical area.
Standard 7: Redevelopment Standards	Full compliance would be achieved. Although this site constitutes redevelopment, it would fully comply with all ten Stormwater Standards.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. Storm drainage structures remaining from the previous development which are part of the redevelopment area would be removed. The proposed station has been designed so that the components included therein are in full compliance with current standards. No statement is made with regard to the drainage system in portions of the site not included in the redevelopment project area.

Taunton Depot Station

Taunton Depot Station would be a new station located on the New Bedford Main Line and would be constructed on a 13-acre site located at Taunton Depot Drive in Taunton, Massachusetts (Figure 4.17-19a). The site is west of the Taunton Depot Shopping Center and is bound by retail buildings to the east and by vegetated wetlands to the south, west, and north. The active New Bedford Main Line tracks are beyond the wetlands west of the site. An existing detention basin associated with the shopping center drainage system is located immediately southeast of the site.

Station Description—Taunton Depot Station would include a center platform with canopy, ancillary landscape improvements, a parking lot with 398 spaces, a pickup/drop off area, bicycle parking facilities,

and utility improvements. A sidewalk that connects the station to the existing sidewalk on Taunton Depot Drive and to the Taunton Gardens apartment complex would be constructed. Improvements at the station site would increase the impervious area by 3.3 acres. The conceptual design for Taunton Depot Station is shown on Figure 4.17-19a.

The existing grading directs stormwater runoff into wetland areas adjacent to the site and the right-of-way. A wetland area containing an unnamed stream would be crossed by the proposed platform access from the parking area. The limits of work would not intersect any named waterbodies or drinking water protection areas. The station site is located in a developed area with existing roads and neighborhoods however; the station facility would introduce new uses and stormwater discharges to the area. The additional pavement and parking would require a stormwater management system to prevent impacts to receiving waters. Treated stormwater would discharge to wetlands adjacent to the site. With proper design of the drainage system, there would be no impacts to surface or groundwater resources.

Stormwater Analysis—For the Taunton Depot Station site, two separate design points were identified and the contributing drainage areas to each were evaluated under existing and proposed conditions. Peak flow reductions were achieved for all storm events through the use of LID techniques and stormwater BMPs such as bioretention basins, a grassed swale, and the use of light colored pavement for sidewalks. The BMPs were sized to manage the water quality volume and recharge volume requirements identified under the Stormwater Standards. The station is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed commuter rail station would increase bacteria loads in the watershed.

The proposed drainage areas for Taunton Depot Station are shown on Figure 4.17-19b. Stormwater runoff from the northern portion of the site sheet flows off of the impervious surface and into Bioretention Basin 1. Bioretention Basin 1 drains to Wetland 1. Stormwater runoff from the southern portion of the site sheet flows off of the impervious surface and into Bioretention Basin 2. Bioretention Basin 2 drains to Wetland 1. Stormwater runoff from the driveway and eastern portion of the site drains to Bioretention Basin 3. Bioretention Basin 3 drains to Wetland 3. Runoff from the northern perimeter of the site is captured in a vegetated swale that discharges to Wetland 1. Runoff from the vegetated southern perimeter of the site sheet flows to Wetland 3. Existing and proposed peak discharge rates to each of the design points for the 2, 10, and 100 year storm events are shown in Table 4.17-27.

Table 4.17-27 Peak Discharge Rates (cfs[1])–Taunton Depot Station

Design Point	2-year	10-year	100-year
Design Point 1: Wetland 1			
Existing	3.1	7.2	15.2
Proposed	3.0	5.3	10.9
Design Point 2: Wetland 3			
Existing	0.5	1.3	3.0
Proposed	0.4	1.0	2.9

1 cubic feet per second

Compliance with Massachusetts Stormwater Standards—Taunton Depot Station has been designed to comply fully with all ten of the Stormwater Standards. Compliance documentation is included in the Taunton Depot Station Stormwater Report (Appendix 4.17-B) and summarized in Table 4.17-28.

Table 4.17-28 Massachusetts Stormwater Standards Compliance–Taunton Depot Station

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. BMPs are proposed to treat stormwater runoff from the site and outlets and conveyances are protected from erosion.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. Peak discharges rates at the design points are expected to be reduced between 0.1 and 4.3 cfs for the range of storm events analyzed.
Standard3: Stormwater Recharge	Full compliance achieved. The required recharge volume of 4,071 cubic feet is managed within the bioretention basins. Because of high groundwater, these basins must be lined and underdrained. Approximately 21,000 cubic feet of volume is provided in the basins and filtered through the soil media before being intercepted by an underdrain and discharged to the adjacent wetland.
Standard 4: Water Quality	Full compliance would be achieved. Eighty percent TSS removal is achieved for all drainage areas with contributions from impervious surfaces.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The station does not qualify as a LUHPPL because it has fewer than 500 parking spaces and does not reach the 1,000 vehicle trip per day threshold.
Standard 6: Critical Areas	Full compliance would be achieved. The site does not discharge near or to a critical area.
Standard 7: Redevelopment Standards	Not applicable. This site is not a redevelopment.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. The site was previously undeveloped and no sanitary sewer or storm drainage infrastructure is known to exist on the site. The proposed station has been designed in full compliance with current standards.

Freetown Station

Freetown Station would be a new station located on the existing Fall River Secondary and would be constructed on an approximately 7 acre site located on South Main Street in Freetown, Massachusetts (Figure 4.17-20a). The site is bounded by woods and wetland to the north and southwest, grassed pasture to the northeast, the Fall River Secondary to the southeast, commercial development to the west, and by South Main Street to the northwest. A portion of this station site is within the Coastal Zone. Compliance with the Coastal Zone Management Regulations is described in Chapter 4.18, *Coastal Zone Management and Chapter 91*.

Station Description—Freetown Station would include a side platform with canopy, ancillary landscape improvements, a parking lot with 173 spaces, a pickup/drop off area, bicycle parking facilities, and utility

improvements. Improvements at the site would increase impervious area by 2.4 acres. The conceptual design for Freetown Station is shown on Figure 4.17-20a.

The site is partially surrounded by wetland areas, including an unnamed stream on the northeast edge and another unnamed stream on the southwest edge. However, the limits of work would not intersect any named waterbodies or drinking water protection areas.

Given that this portion of the site is undeveloped, a new stormwater drainage system would be required. A stormwater management area would be included at the west end of the site to treat and manage stormwater flows from the west portion of the parking lot. This stormwater management area would discharge to the wetland southwest of the site. A second and third management area would be included at the northeast portion of the site to treat and manage stormwater flows from the entrance roadways and east portion of the parking lot. These stormwater management areas would discharge to the wetland north of the site. With proper design of the stormwater management system, there would be no impacts to surface or groundwater resources.

Stormwater Analysis—For the Freetown Station site, one design point was identified and the contributing drainage areas to that design point were evaluated under existing and proposed conditions. Peak flow reductions were achieved for all storm events through the use of LID techniques and stormwater BMPs such as minimizing disturbance to existing trees and vegetation, infiltration basins, grassed swales, and the use of light colored pavement for sidewalks. The BMPs were sized to manage the water quality volume and recharge volume requirements identified under the Stormwater Standards. The station is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed commuter rail station would increase bacteria loads in the watershed.

The proposed drainage areas for Freetown Station are shown on Figure 4.17-20b. Stormwater runoff from the northern portion of the site sheet flows off of the impervious surface and into Infiltration Basin 1. Infiltration Basin 1 drains to Wetland 1. Stormwater runoff from the southern portion of the site sheet flows off of the impervious surface and into Infiltration Basin 2. Infiltration Basin 2 drains to Wetland 1. Stormwater runoff from the driveway and eastern portion of the site drains to Infiltration Basin 3. Infiltration Basin 3 drains to Wetland 3. Runoff from the northern perimeter of the site is captured in a vegetated swale that discharges to Wetland 1. Runoff from the vegetated southern perimeter of the site sheet flows to Wetland 3. Existing and proposed peak discharge rates to each of the design points for the 2, 10, and 100 year storm events are shown in Table 4.17-29.

Table 4.17-29 Peak Discharge Rates (cfs[1])–Freetown Station

Design Point	2-year	10-year	100-year
Design Point 1: Wetland 1			
Existing	10.8	18.3	33.4
Proposed	10.4	17.3	31.8

1 cubic feet per second

Compliance with Massachusetts Stormwater Standards—Freetown Station has been designed to comply fully with all ten of the Stormwater Standards. Compliance documentation is included in the Freetown Station Stormwater Report (Appendix 4.17-B) and summarized in Table 4.17-30.

Table 4.17-30 Massachusetts Stormwater Standards Compliance–Freetown Station

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. BMPs are proposed to treat stormwater runoff from the site and outlets and conveyances are protected from erosion.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. Peak discharges rates at the design point are expected to be reduced between 0.4 and 1.6 cfs for the range of storm events analyzed.
Standard 3: Stormwater Recharge	Full compliance would be achieved. Approximately 8,600 cubic feet of volume is provided in the infiltration basins, exceeding the required recharge volume of 4,676 cubic feet.
Standard 4: Water Quality	Full compliance would be achieved. Eighty percent TSS removal is achieved for all drainage areas with contributions from impervious surfaces.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The station does not qualify as a LUHPPL because it has fewer than 500 parking spaces and does not reach the 1,000 vehicle trip per day threshold.
Standard 6: Critical Areas	Full compliance would be achieved. The site does not discharge near or to a critical area.
Standard 7: Redevelopment Standards	Not applicable. This site is not a redevelopment.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. The site was previously undeveloped and no sanitary sewer or storm drainage infrastructure is known to exist on the site. The proposed station has been designed in full compliance with current standards.

Fall River Depot Station

Fall River Depot Station would be a new station located on the existing Fall River Secondary and would be constructed on an approximately 7 acre site on North Davol Street in Fall River, Massachusetts (Figure 4.17-21). The site is bounded by North Davol Street to the west, Pearce Street to the north, Turner Street to the south, and the Fall River Secondary to the east. A portion of the station site is within the Coastal Zone. Compliance with the Coastal Zone Management Regulations is described in Chapter 4.18, *Coastal Zone Management and Chapter 91*.

Station Description—Fall River Depot Station would include a side platform with canopy, a parking lot with 524 spaces in a structured parking facility, bicycle parking facilities, a bus way, and utility improvements. Construction of the station would involve demolishing several commercial and industrial buildings that currently exist on the site. Because the site is completely covered by pavement or buildings under existing conditions, the improvements would result in no change to the amount of

impervious area at the site. The conceptual design for Fall River Depot Station is shown on Figure 4.17-21.

This site was previously developed as a historic train station and subsequent industrial uses. The new station is envisioned to be a multi-modal transportation center with new mixed-use development and parking facilities. Under the Build Alternatives, the station would include approximately 534 parking spaces in a garage. Drainage inside the garage would discharge to the sanitary sewer as required by health codes, while outdoor stormwater would be discharged to the municipal stormwater system. The limits of work would not affect any waterbodies or drinking water protection areas.

Given the existing industrial character of the local waterfront and the other highways and parking areas nearby, the station would not be expected to increase the potential for water pollution. Existing peak flows into the municipal stormwater system would be maintained through the sizing of the closed drainage system and, if necessary, by the addition of subsurface detention chambers. With a stormwater design to prevent flooding and remove suspended solids, there would be no impacts to the local stormwater system or to surface or groundwater resources.

Stormwater Analysis—The reconstruction of Fall River Depot Station would occur within the existing footprint of a previously developed site and would constitute redevelopment. Under existing and proposed conditions, drainage from the site flows to the municipal separate storm sewer system. No wetland resources are present on the site and no construction is proposed within any water bodies or drinking water protection areas. In accordance with NPDES requirements, stormwater runoff from the lower level of the parking garage would be treated in an oil/grit separator and would be drained to the sanitary sewer system. The station is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed improvements at the site would increase bacteria loads in the watershed.

Compliance with Massachusetts Stormwater Standards—Fall River Depot Station would be designed to comply with all ten of the Stormwater Standards to the maximum extent practicable.

Battleship Cove Station

Battleship Cove Station would be a new station on the existing Fall River Secondary and would be constructed at the existing Gates of Ponta Delgada monument on Water Street in Fall River, Massachusetts. The site is bounded by a commercial and industrial complex to the north, the Fall River Secondary to the east, Firestone Pond to the south, and the Ponta Delgada monument to the west. A portion of this station site is within the Coastal Zone. Compliance with the Coastal Zone Management Regulations is described in Chapter 4.18, *Coastal Zone Management and Chapter 91*.

Station Description—Improvements at Battleship Cove Station are limited to a side platform with canopy, construction of access walkways, stairs and ramps associated with access from the existing monument to the platform, bicycle parking facilities, and landscape retaining walls. No additional parking or other impervious areas would be created. The conceptual design for Battleship Cove Station is shown on Figure 4.17-22.

The Battleship Cove station site would not require development of an undeveloped area, which greatly reduces the net increase in impervious area and any potential for water resource impacts. The closest waterbodies are Firestone Pond and a pond east of the station, sometimes referred to as Crab Pond, which is fed by an unnamed stream that flows under the railroad right-of-way behind the station.

Firestone Pond is located across Water Street from the site but would not be affected by the new station. Crab Pond would be adjacent to the new platform but would not have any long-term impacts from the operation of the station. There would be no direct stormwater discharges to these ponds. Stormwater runoff from the station site would drain into the municipal stormwater system on Water Street. Potential drainage upgrades, if required for the final design, would be coordinated with the City of Fall River. Given the nature of the proposed use, the station would have no impacts to surface or groundwater resources.

Stormwater Analysis—No stormwater analysis was conducted for Battleship Cove Station because the proposed platform would result in a negligible increase in impervious area. The station is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed platform construction would increase bacteria loads in the watershed.

Compliance with Massachusetts Stormwater Standards—The proposed platform at Battleship Cove Station would result in a negligible increase in impervious area and would be designed to comply with all ten of the Stormwater Standards to the maximum extent practicable.

King's Highway Station

King's Highway Station would be a new commuter rail station that would occupy part of an approximately 55 acre site that is now a shopping plaza with a large bituminous asphalt paved parking lot. The existing New Bedford Main Line runs along the eastern boundary of the existing parking lot.

Station Description—Construction of the new station would be limited to construction of an elevated platform and canopy within the existing right-of-way and a sidewalk to connect the platform and off-site walkways. The conceptual design for King's Highway Station is shown on Figure 4.17-23.

The station would include approximately 360 existing shared parking spaces. The King's Highway station site would reuse a developed area and would cause no net increase in impervious area. Since there would be no increase in impervious area and no change in use, there would be no modifications required to the stormwater drainage system and no impacts to water resources. The limits of work would not affect any waterbodies or drinking water protection areas. No impacts are anticipated to any surface or groundwater resources.

Stormwater Analysis—No stormwater analysis was conducted for King's Highway Station because improvements at the station result in a negligible increase in impervious area. The station is within the Buzzards Bay watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed platform would increase bacteria loads in the watershed.

Compliance with Massachusetts Stormwater Standards—Improvements at the King's Highway Station result in a negligible increase in impervious area and would be designed to comply with all ten of the Stormwater Standards to the maximum extent practicable.

Whale's Tooth Station

Whale's Tooth Station would be a new commuter rail station at the existing 14-acre Whale's Tooth parking lot on Acushnet Avenue in New Bedford, Massachusetts. The station would be constructed adjacent to an existing parking lot constructed by the City of New Bedford. The site is bounded to the north by commercial and industrial buildings, to the east by the New Bedford Main Line, and to the

south and west by Acushnet Avenue (Figure 4.17-24). A portion of this station site is within the Coastal Zone. Compliance with the Coastal Zone Management Regulations is described in Chapter 4.18, *Coastal Zone Management and Chapter 91*.

Station Description—Construction of the new station would be limited to construction of an elevated platform and canopy. Because the site is completely covered by pavement or ballast under existing conditions, the improvements would result in a negligible change to the amount of impervious area at the site. The conceptual design for Whale's Tooth Station is shown on Figure 4.17-24.

The limits of work would not affect any waterbodies or drinking water protection areas. New Bedford Harbor is east of the site and is separated from the site by existing industrial development. Given the existing industrial character of the local waterfront and the benign nature of the proposed use, the station would not be expected to increase the potential for water pollution. The existing parking lot has an underground drainage system that discharges near the tracks. This drainage system would remain in place for the station and may not require any upgrades to provide effective stormwater management, as the site improvements would occur almost entirely within the existing built footprint. No impacts are expected to surface or groundwater resources.

Stormwater Analysis—The Whale's Tooth Station would be constructed within the existing footprint of a previously developed site and would constitute redevelopment. Under existing and proposed conditions, drainage from the site flows to the municipal separate storm sewer system. No wetland resources are present on the site and no construction is proposed within any water bodies or drinking water protection areas. The station is within the Buzzards Bay watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed platform would increase bacteria loads in the watershed.

Compliance with Massachusetts Stormwater Standards—Whale's Tooth Station would be designed to comply with all ten of the Stormwater Standards to the maximum extent practicable.

Dana Street Station

The DEIS/DEIR included a station in downtown Taunton that would serve the Whittenton Alternative (and the Attleboro Alternative, which has been dismissed from further consideration). The downtown Taunton Station site is no longer available, having been developed as a residential property in the interim. MassDOT reviewed other potential station locations along the Whittenton Branch and the short segment of the Attleboro Secondary that would be used for the Whittenton Alternative. A vacant site along the Attleboro Secondary just south of the Danforth Street at-grade crossing, within walking distance of downtown Taunton, has been selected. The station would be on the east side of the railroad, between the alignment and Dana Street, and would be identified as the Dana Street Station.

Dana Street Station (Figure 4.17-25) would serve walk-in, bike-in, and drive-in customers with 477 parking spaces. Space has been reserved for basins and drainage may tie in to the municipal system. The station would be designed in compliance with Massachusetts Stormwater Standards, using appropriate Best Management Practices (BMPs) to maintain groundwater recharge and reduce the discharge of pollutants. No further stormwater analysis has been completed at this time.

Station Summary

With the exception of Stoughton Station and Dana Street Station, stormwater management systems at each of the new stations have been designed to comply fully with the Stormwater Standards and the Clean Water Act.

Table 4.17-31 summarizes key stormwater information related to the station sites. Four of the proposed stations would consist of platforms only, and would result in a negligible increase in stormwater runoff. These platforms would all be within the existing railbed and are considered redevelopment. Seven new stations are proposed which would consist of parking lots and platforms. Fall River Depot Station would use a parking structure rather than at-grade parking. Two of the stations (Taunton and Raynham Park) would be redevelopment of previously disturbed, mostly paved, sites. The remaining three stations (North Easton, Taunton Depot, and Freetown) would be constructed in undeveloped vegetated areas. All of the stations would incorporate the appropriate BMPs and would fully comply with the Stormwater Standards.

Table 4.17-31 Station Site Summary

Station	Proposed Construction	Existing or Proposed Station	Meets Redevelopment Criteria	Discharge Location or Receiving Waterbody	Within TMDL Watershed	Change in Impervious Area (ac)[6]
Canton[1]	Relocated Platform	Existing	Yes	MS4	Yes[3]	-
North Easton	Platform & Parking	Proposed	No	Wetlands	Yes[4]	+1.8
Easton Village[1]	Platform Only	Proposed	Yes	Queset Brook	Yes[4]	-
Raynham Park	Platform & Parking	Proposed	Yes	Hockomock Swamp	Yes[4]	- 0.5
Taunton	Platform & Parking	Proposed	Yes	Wetland	Yes[4]	-2.8
Taunton Depot	Platform & Parking	Proposed	No	Wetland	Yes[4]	+3.3
Freetown	Platform & Parking	Proposed	No	Wetland	Yes[4]	+2.4
Fall River	Platform & Structured Parking	Proposed	Yes	MS4	Yes[4]	-
Battleship Cove[1]	Platform Only	Proposed	Yes	Wetland	Yes[4]	-
King's Highway[1]	Platform Only	Proposed	Yes	Wetland	Yes[5]	-
Whale's Tooth[1]	Platform Only	Proposed	Yes	MS4	Yes[5]	-

1 Construction/Reconstruction of platforms and canopy only.
2 Relocation of existing station, a separate report would be issued once conceptual design is completed.
3 MassDEP, 2002. *Total Maximum Daily Loads of Bacteria for the Neponset River Watershed*. May 2002. Control Number: CN 121.0.
4 MassDEP, 2011. *Final Pathogen TMDL for the Taunton River Watershed*. June 2011. Control Number: CN 256.0.
5 MassDEP, 2009. *Final Pathogen TMDL for the Buzzards Bay Watershed.* March 2009. Control Number: CN 251.1.
6 – denotes no change

Layover Facilities

Two new overnight layover facilities are proposed as part of the South Coast Rail project. These facilities are proposed near the southern terminus of the New Bedford Main Line (Wamsutta) and the southern terminus of the Fall River Secondary (Weaver's Cove East). The facilities are necessary to provide locations for train sets to be stored overnight, for train crews board the train at the start of each shift, and for minor maintenance activities to be performed to the trains.

Both proposed layover facilities would be located on previously developed sites and qualify under the Stormwater Standards as redevelopment. The stormwater management features at both layover facilities were evaluated for compliance with state and federal stormwater regulations and with the requirements of the Secretary's Certificate. As previously stated, railroad layover facilities are considered a LUHPPL as defined in 310 CMR 10.04 and 314 CMR 9.02. As a result, certain BMPs are required to prevent contamination of local wetlands and water resources such as the New Bedford Inner Harbor or the Taunton River. The storage tracks would have drip pans (collection trays) to catch any incidental drips, leaks, or spills of hazardous materials that may occur during storage or maintenance. The drip pans would be connected to an oil/grit separator that would separate petroleum products from stormwater runoff prior to discharge, protecting wetland and water resources from contamination. Any oil or other hazardous materials stored at the site would be secured with secondary containment structures to catch any spills. With the proposed containment measures in place, neither layover facility would pose a significant risk to surface or groundwater resources.

For the hydrologic analysis of the Weaver's Cove East Layover Facility, the site was divided into several drainage areas that contribute runoff to one or more design points. Peak discharge rates were evaluated at these design points under pre- and post-development conditions in order to demonstrate compliance with the Stormwater Standards.

The rainfall-runoff response of this site under existing and proposed conditions was evaluated for storm events with recurrence intervals of 2, 10, and 100 years. Rainfall depths used for this analysis were based on the NRCS Type III, 24-hour storm event; they were 3.4, 4.8, and 7.0 inches, respectively. Curve numbers for the pre- and post-development conditions were determined using NRCS TR 55 methodology as provided in HydroCAD. The HydroCAD model is based on the NRCS TR 20 Model for Project Formulation Hydrology. Detailed printouts of the HydroCAD analyses are included in the Weaver's Cove East Layover Facility Stormwater Report provided in Appendix 4.17-C. Drainage areas used in the analyses are summarized below and are fully described in Appendix 4.17-C. As noted above, these analyses were not conducted for the Wamsutta Layover Facility.

The closed drainage system for the Weaver's Cove East Layover Facility was designed for the 25-year storm event, in accordance with the MBTA's requirements. Drainage pipes were sized using Manning's Equation for full-flow capacity and the Rational Method. Additionally, the performance of the system was analyzed using StormCAD, a HEC-22 based program. Pipe sizing calculations are included in the Weaver's Cove East Layover Facility Stormwater Report provided in Appendix 4.17-C. These analyses were not conducted for the Wamsutta Layover Facility.

Soil characteristics for the Weaver's Cove East Layover Facility site were assessed according to the USDA NRCS soil mapping. In accordance with the Stormwater Standards, soil infiltration capacity was evaluated according to the 1982 Rawls Rates.

The latest FEMA Flood Insurance Rate Maps (FIRMs) were reviewed for each layover facility site in order to evaluate for potential impacts within the 100 year floodplain. According to the latest maps available from FEMA, neither site was found to be located within the 100 year floodplain. A copy of the latest FIRM for each site is included in the individual layover facility stormwater reports provided in Appendix 4.17-C.

The Secretary's Certificate on the DEIR and the Stormwater Regulations at 310 CMR 10.05(6)(k) require MassDOT to consider ESSD and LID design practices. Within the constraints of the fixed elevation of the existing rail bed and the need to have layover tracks be nearly level, the proposed topography at each layover facility matches the existing topography to the extent practicable and existing drainage patterns would be maintained. To reduce peak runoff rates, existing mature vegetation would be preserved and unnecessary impervious areas would be removed. Runoff from existing and proposed impervious areas is disconnected where possible and directed to LID features such as filter strips, grassed swales, and infiltration basins. Infiltration basins were incorporated wherever possible to mimic natural hydrology and to improve groundwater recharge. Additional LID features such as pervious pavement and rain barrels were evaluated to reduce the amount of connected impervious area at the operations and maintenance buildings.

Non-structural water quantity and quality control BMPs to be implemented at the layover facilities include:

- **Snow Management:** No snow would be placed in, or directly adjacent to wetland resource areas. As much as possible snow would be allowed to melt on pavement where debris and sand may be deposited and swept up for disposal. Snow melt would enter the stormwater management system where it would receive proper treatment.

- **Spill Prevention:** Spill prevention is achieved with the proper storage and handling of hazardous materials. During construction, this is addressed in the SWPPP for Construction Activities that would be prepared prior to the start of construction activities. As required under the Clean Water Act (40 CFR Part 112), an operational phase Spill Prevention, Control and Countermeasures (SPCC) Plan would also be prepared prior to the commencement of operations at each layover facility.

- **Source Control:** A comprehensive source control program would be implemented at each layover facility, which includes regular pavement sweeping, catch basin cleaning, and enclosure and maintenance of all dumpsters, compactors, and loading areas. MBTA would develop a detailed Operations and Maintenance (O&M) Plan during the final design phase of the project and would include it with the Notice of Intent submittal. This plan would address specific maintenance measures that must be performed and the required frequency in order to maintain the stormwater management measures at each layover facility.

Structural water quantity and quality control BMPs to be implemented at each layover facility (not all BMPs are suitable for each site) include:

- **Catch Basins with Sumps and Oil/debris Traps**: Catch basins at layover facilities are to be constructed with sumps (minimum 4 feet) and oil/debris traps to prevent the discharge of sediments and floating contaminants. Catch basins would be inspected and cleaned according to the maintenance schedule laid out in the O&M Plan.

- **Drip Pans (Collection Trays):** As previously described in the DEIS/DEIR, the storage tracks would have drip pans or collection trays to catch any incidental drips, leaks, or spills of hazardous materials that may occur during storage or maintenance of the trains. Runoff and contaminants collected in drip pans would be connected to an oil/grit separator prior to discharge to another BMP or to the municipal storm drain. Drip pans would be inspected and cleaned according to the maintenance schedule laid out in the O&M Plan.

- **Oil/Grit Separator:** MassDEP requires the use of a pretreatment BMP, such as an oil/grit separator, for sites that constitute LUHPPLs. These structures are underground storage tanks consisting of three chambers that are separated by interior baffle walls. The placement of the interior baffles and the outlet from the structure are designed to remove heavy particulates, floating debris and hydrocarbons from stormwater. Oil/grit separators would be cleaned regularly to remove accumulated debris and maintain functionality, in accordance with the maintenance schedule laid out in the O&M Plan.

- **Vegetated (Grass & Gravel) Filter Strip:** A vegetated or grass filter strip is a linear stormwater management measure that is generally oriented parallel to the contributing drainage area and treats sheet flow or small quantities of concentrated flows that can be distributed along the width of the filter strip. A level spreader, consisting of a pea gravel diaphragm or other similar feature, runs the width of the area being treated. The level spread intercepts and dissipates runoff to minimize the risk of erosion due to concentrated flows. Vegetated filter strips are maintained (mowed) in conjunction with standard site landscape maintenance. Periodic inspections of filter strip are necessary to ensure that it is operating as required. Additional guidance for filter strip inspection and maintenance requirements would be provided in the O&M Plan.

- **Vegetated (Grass) Swales:** Vegetated swales provide some treatment, reduction, and distribution of stormwater during conveyance. Pollutant removal mechanisms include filtering by the swale vegetation (both on side slopes and on bottom), filtering through a subsoil matrix,[23] and/or infiltration into the underlying soils. Trash removal and vegetation management are required in conjunction with standard landscape maintenance. Additional guidance for vegetated swale inspection and maintenance requirements would be provided in the O&M Plan.

- **Infiltration Basins:** Infiltration basins are stormwater runoff impoundments that are constructed in areas with permeable soils. Pretreatment of runoff is critical to prevent the basin from becoming clogged with fine sediment and suffering premature failure. Runoff from the design storm is stored until it exfiltrates through the soil of the basin floor. Trash removal and vegetation management are required in conjunction with standard landscape maintenance. Periodic inspections are required to ensure that the basin drains within 72 hours of the design storm event. If the basin is not draining adequately, a layer of sediment may need to be removed from the floor of the basin to restore infiltration capacity. Additional guidance for infiltration basin inspection and maintenance requirements would be provided in the O&M Plan.

[23] The soil matrix is the portion (usually more than 50 percent) of a given soil layer that has the predominant color, http://www.wetlands.com/coe/87manp3b.htm.

Weaver's Cove East Layover Facility

The Weaver's Cove East Layover Facility would be a new overnight layover facility located near the terminus of the Fall River Secondary in Fall River, Massachusetts. The proposed facility would be constructed on an approximately 18 acre site located on the east side of the Fall River Secondary, northeast of the former Weaver's Cove Energy facility. Portions of the site were previously developed, and existing development on the site is limited to approximately 4.4 acres of paved areas, building foundations, and other impervious areas. The site is bounded to the north and south by residential development, to the east by North Main Street, and to the west by the Fall River Secondary and the Taunton River (Figure 4.17-26a). A portion of this layover facility is within the Coastal Zone. Compliance with the Coastal Zone Management Regulations is described in Chapter 4.18, *Coastal Zone Management and Chapter 91*.

Layover Facility Description—The Weaver's Cove East Layover Facility would include six layover tracks, a paved driveway and access aisle around the layover tracks, ancillary landscape improvements, a 41 space parking lot, two operation and maintenance buildings, a power substation and other utility improvements. Constructing this facility would include demolishing concrete pads and multiple bituminous driveways that currently exist on the site and would reduce the impervious area by 0.91 acres. The conceptual design of the Weaver's Cove East Layover Facility is shown on Figure 4.17-26a.

Stormwater Analysis—For the Weaver's Cove East Layover Facility, four design points were identified and the contributing drainage areas to each design point were evaluated under existing and proposed conditions. Peak flow reductions were achieved for all storm events through the use of LID techniques and stormwater BMPs such as reducing impervious area, drip pans, gravel and grass filter strips, oil/grit separators, vegetated swales, sediment forebays, and infiltration basins. The BMPs were sized to manage the water quality volume and recharge volume requirements identified under the Stormwater Standards. The layover facility is within the Taunton River watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the layover facility would increase bacteria loads in the watershed.

The proposed drainage areas for Weaver's Cove East Layover Facility are shown on Figure 4.17-26b. Drainage Areas 1, 3, and 4 include vegetated areas as well as smaller amounts of impervious cover from driveways and paved parking areas. Runoff from the impervious portions of these drainage areas would sheet flow over gravel and grass filter strips prior to discharge to vegetated swales that would convey flows to one of the sediment forebays that is associated with Infiltration Basin 2. Overflows from this basin would be discharged via an outlet control structure to the existing closed drainage system which subsequently discharges to the Taunton River.

Three of the drainage areas on the eastern portion of the site (Drainage Areas 2, 6, and 7) would be predominantly landscaped areas with insignificant amounts of impervious cover. Areas of impervious cover within these drainage areas would flow over gravel and grass filter strips for pretreatment. Stormwater runoff from these drainage areas would sheet flow into Infiltration Basins 1, 3, and 4, respectively. These basins are designed to infiltrate all stormwater drainage from their contributing drainage areas that is collected during a 100 year storm event.

Drainage from the western portion of the site that contains the layover tracks, paved access aisles, and paved driveways (Drainage Area 5) would be collected in an underdrain system and directed to an oil/grit separator. Treated flows from the oil/grit separator would then be discharged to a sediment

forebay prior to entering Infiltration Basin 2. Overflows from this basin would be discharged via an outlet control structure to the existing closed drainage system which subsequently discharges to the Taunton River.

Two smaller drainage areas on the western portion of the site (Drainage Areas 8 and 9) consist of pervious areas that sheet flow to an existing ditch and culvert along the railroad right-of-way, prior to discharge to the Taunton River. This drainage pattern would be maintained under the proposed conditions.

Existing and proposed peak discharge rates to each of the design points for the 2, 10, and 100 year storm events are shown in Table 4.17-32.

Table 4.17-32 Peak Discharge Rates (cfs[1])–Weaver's Cove East Layover Facility

Design Point	2-year	10-year	100-year
Design Point 1: Taunton River			
Existing	14.5	23.6	39.0
Proposed	2.7	4.6	22.1
Design Point 2: Wet Area 2			
Existing	4.1	8.4	16.0
Proposed	0.0	0.0	0.0
Design Point 3: Wet Area 3			
Existing	1.5	3.1	5.7
Proposed	0.0	0.0	0.0
Design Point 4: Wetland 4			
Existing	1.5	2.8	5.2
Proposed	0.0	0.0	0.0

1 cubic feet per second

Compliance with Massachusetts Stormwater Standards—Weaver's Cove East Layover Facility has been designed to comply fully with all ten of the Stormwater Standards. Compliance documentation is included in the Weaver's Cove East Layover Facility Stormwater Report (Appendix 4.17-C) and summarized in Table 4.17-33.

Table 4.17-33 Massachusetts Stormwater Standards Compliance – Weaver's Cove East Layover Facility

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. BMPs are proposed to treat stormwater runoff from the site and outlets and conveyances are protected from erosion.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. Although this requirement may be waived because the site discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04, peak discharge rates at the design points are expected to be reduced between 1.5 and 19.0 cfs for the range of storm events analyzed.
Standard3: Stormwater Recharge	Full compliance would be achieved. The required recharge volume of 4,785 cubic feet is managed within the infiltration basins. Approximately 118,525 cubic feet of volume is provided in the infiltration basins.
Standard 4: Water Quality	Full compliance would be achieved. Eighty percent TSS removal is achieved for all drainage areas with contributions from impervious surfaces.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The layover facility qualifies as a LUHPPL because the use is regulated under the NPDES Multi-Sector General Permit. Containment and treatment measures would be used to prevent the release of oil or hazardous materials.
Standard 6: Critical Areas	Full compliance would be achieved. The site does not discharge near or to a critical area.
Standard 7: Redevelopment Standards	Full compliance would be achieved. Although a portion of this site constitutes redevelopment, it would fully comply with all ten Stormwater Standards.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. Storm drainage structures remaining from the previous development which are part of the redevelopment area would be removed. The proposed layover facility has been designed so that the components included therein are in full compliance with current standards. No statement is made with regard to the drainage system in portions of the site not included in the redevelopment project area.

Wamsutta Layover Facility

The Wamsutta Layover Facility would be a new overnight layover facility near the terminus of the New Bedford Main Line in New Bedford, Massachusetts. The site of the proposed facility is an approximately 9 acre parcel that was historically used as a railroad yard. A three-foot thick, permeable, engineered

barrier was constructed on top of the historic railroad yard. The infrastructure for the proposed layover facility is designed to minimize disturbance to the engineered barrier and would be constructed with as few protrusions into the barrier as possible. The facility would be located between the existing freight tracks to the east, a row of commercial properties on Wamsutta Street to the north, Whale's Tooth Station to the south, and the New Bedford Main Line to the west (Figure 4.17-27). Construction of the layover facility would increase the impervious area by approximately 2.0 acres. A portion of this layover facility is within the Coastal Zone. Compliance with the Coastal Zone Management Regulations is described in Chapter 4.18, *Coastal Zone Management and Chapter 91*.

Layover Facility Description—The Wamsutta Layover Facility would include six layover tracks, a paved driveway and access aisle around the layover tracks, ancillary landscape improvements, a 39 space parking lot, two operations and maintenance buildings, a power substation and other utility improvements. The conceptual design of the Wamsutta Layover Facility is shown on Figure 4.17-27.

Stormwater Analysis—For the Wamsutta Layover Facility, three design points were identified and the contributing drainage areas to each design point were evaluated under existing and proposed conditions. LID techniques and stormwater BMPs such as drip pans, oil/grit separators, water quality manholes, and vegetated swales would be used to manage and treat runoff. The BMPs were sized to manage the water quality volume requirements identified under the Stormwater Standards. Because the layover facility is located on a site where contamination is capped in place, recharge is required only to the maximum extent practicable. The site drains to the municipal separate storm sewer within a coastal watershed and is not required to manage runoff for peak rate controls. The layover facility is within the Buzzards Bay watershed and is subject to the approved TMDL for pathogens in the watershed. It is not anticipated that the proposed layover facility would increase bacteria loads in the watershed.

At this time, no ground survey is available for the site. As a result, the proposed drainage design is conceptual and hydrologic, hydraulic, and geotechnical analyses have not been completed. It is important to note that the cap under the proposed Wamsutta Layover was designed and built with consideration for a future layover; it is staged, therefore, to accommodate the SCR facility. The Wamsutta Layover was also designed to not impact the cap. If, however, there is impact it would be mitigated to maintain the cap's functionality.

Compliance with Massachusetts Stormwater Standards—The Wamsutta Layover Facility would be designed to comply fully with all ten of the Stormwater Standards. Preliminary compliance documentation is included in the Wamsutta Layover Facility Stormwater Report (Appendix 4.17-C) and summarized in Table 4.17-34.

Table 4.17-34 Massachusetts Stormwater Standards Compliance–Wamsutta Layover Facility

Standard	Compliance Level Achieved
Standard 1: No New Untreated Discharges or Erosion to Wetlands	Full compliance would be achieved. The site would continue to drain to existing municipal storm sewers.
Standard 2: Peak Rate Attenuation	Full compliance would be achieved. This requirement may be waived because the site discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.
Standard3: Stormwater Recharge	Full compliance would be achieved. Because the site is located on a site where contamination is capped in place, MassDEP requires infiltration only to the maximum extent practicable.
Standard 4: Water Quality	Full compliance would be achieved. Eighty percent TSS removal would be achieved for all drainage areas with contributions from impervious surfaces.
Standard 5: Land Uses with Higher Potential Pollutant Loads	Full compliance would be achieved. The layover facility qualifies as a LUHPPL because the use is regulated under the NPDES Multi-Sector General Permit. Containment and treatment measures would be used to prevent the release of oil or hazardous materials.
Standard 6: Critical Areas	Full compliance would be achieved. The site does not discharge near or to a critical area.
Standard 7: Redevelopment Standards	Full compliance would be achieved. Although this site constitutes redevelopment, it would fully comply with all ten Stormwater Standards.
Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls	Full compliance would be achieved. The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities.
Standard 9: Operation and Maintenance Plan	Full compliance would be achieved. MassDOT would develop a detailed O&M plan during final design as part of the Notice of Intent submittal.
Standard 10: Prohibition of Illicit Discharges	Full compliance would be achieved. With the exception of storm drainage infrastructure that is associated with the engineered barrier at the site, storm drainage structures remaining from the previous development which are part of the redevelopment area would be removed. The proposed layover facility has been designed so that the components included therein are in full compliance with current standards. No statement is made with regard to the drainage system in portions of the site not included in the redevelopment project area.

Layover Summary

The two layover facilities that would be constructed would fully comply with the Stormwater Standards. Table 4.17-35 provides summarizes key stormwater information related to the proposed layover facilities. Both layover facilities are considered "redevelopment" since they have been partially or fully sited on previously developed land. The layover facilities have been designed with appropriate BMPs to manage and treat stormwater runoff from a LUHPPL. Both facilities are proposed within coastal watersheds, and are not required to manage runoff for peak rate controls.

Table 4.17-35 Layover Facility Summary

Layover Facility	Existing or Proposed Facility	Meets Redevelopment Criteria	Discharge Location or Receiving Waterbody	Within TMDL Watershed	Change in Impervious Area (ac)
Weaver's Cove East	Proposed	Yes	Taunton River	Yes[1]	+0.9
Wamsutta	Proposed	Yes	MS4	Yes[2]	+2.0

1 MassDEP, 2011. *Final Pathogen TMDL for the Taunton River Watershed*. June 2011. Control Number: CN 256.0.
2 MassDEP, 2009. *Final Pathogen TMDL for the Buzzards Bay Watershed.* March 2009. Control Number: CN 251.1.

4.17.3.4 Temporary Construction-Period Impacts

In the absence of mitigation, the construction phases for each Build Alternative could result in short-term, temporary impacts that would end when construction is complete. As construction would take several years, these impacts would vary in time and place as different phases of the project were completed. A NPDES permit, specifically, the General Permit for Discharges From Construction Activities[24] (effective February 16, 2012) would be required from the U.S. Environmental Protection Agency, and would specify measures required to prevent construction-related stormwater impacts.

Although the Build Alternatives differ, the types of construction-related impacts would be similar. Water quality impacts, reduction to groundwater recharge, and changes to surface hydrology due to construction could be caused by three primary types of activities:

- Erosion and sedimentation from earthwork;
- Spills of hazardous materials; and
- Dewatering.

The construction of rail lines, highways, bridges, culverts, stations, and layover facilities would expose unvegetated soil that could erode and be deposited in local waterways if appropriate mitigation measures were not taken. This increased sediment load could have an adverse effect on organisms in the receiving waters by increasing the turbidity of the water, altering the channel shape, covering eggs or other sensitive life stages with silt, or transporting any contaminants associated with the sediments. The construction of bridges or culverts may involve construction within a stream or other waterbody using cofferdams, which could disturb sediments in the streambed or lakebed and have similar effects. Cofferdams would temporarily alter flow in the stream channel and could cause increased sedimentation upstream until the cofferdams were removed. Excavation and construction near known contaminated sites would be more likely to encounter contaminated sediments than construction in clean or undisturbed areas.

Construction using heavy equipment would require storing and transporting fuel on site. An accidental release of fuel during refueling could have the potential to contaminate soil, groundwater, and surface water. Potential impacts would be more pronounced in proximity to drinking water supplies, such as within Zone I, Zone II, or Zone A areas. Spill containment procedures, including limiting the areas in which fueling could be performed, would be implemented to minimize any risk of spills or

[24] US Environmental Protection Agency. 2012. National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. US EPA, April 16, 2013, <http://www.epa.gov/npdes/pubs/cgp2012_finalpermit.pdf> (April 25, 2013)

contamination. With proper containment and handling procedures in place, there would be no effects on surface or groundwater resources after construction was completed.

Construction near or within streams and wetland areas may require dewatering during construction activities to keep excavated areas free of groundwater. Untreated dewatering fluids are typically filled with silt and sediment, which could be harmful to surface waters if discharged directly. Dewatering could also expose pollutants from contaminated groundwater, particularly near existing contaminated sites. Any contamination encountered would be handled appropriately in compliance with Massachusetts standards and in coordination with MassDEP. All dewatering discharges would require controls as described in Section 4.17.3.6, *Mitigation*.

Based on this assessment, the potential impacts to surface and groundwater resources during construction could be prevented with proper construction management and monitoring. With mitigation in place, none of the potential construction-period impacts would have any significant or long-term effects on surface and groundwater resources. Section 4.17.3.6, *Mitigation*, describes proposed mitigation measures for short- and long-term impacts to surface and groundwater resources.

4.17.3.5 Summary of Impacts By Alternative

This section summarizes the potential direct and indirect effects on water resources from each of the South Coast Rail alternatives (Table 4.17-36). All of the Build Alternatives would have the potential to affect waterbodies and drinking water protection areas. All of the Build Alternatives would require construction within public water supply Zone I areas, which is the area within 400 feet of a well that is generally afforded the greatest protection from development. All of the Build Alternatives would upgrade existing transit corridors, which would have a negligible effect on pollutant loading. The Build Alternatives would upgrade existing transit corridors but would also build new rail lines on disused rail corridors, potentially introducing new pollutant sources in those areas. With mitigation and drainage features in place, none of the Build Alternatives are expected to impair any water resources.

Table 4.17-36 Summary of Potential Water Resource Impacts by Alternative

	Proposed Stormwater Discharges to Waterbodies		Construction in Drinking Water Protection Areas[1]				Proposed Stormwater Discharges to Drinking Water Protection Areas[1]			
Alternative	ACEC/ ORWs	Non-ORWs	Zone A	Zone I	Zone II	IWPA	Zone A	Zone I	Zone II	IWPA
Stoughton Electric	2	9	1	0	6	2	1	0	6	2
Stoughton Diesel	2	9	1	0	6	2	1	0	6	2
Whittenton Electric	2	10	1	1	10	2	1	0	10	2
Whittenton Diesel	2	10	1	1	10	2	1	0	10	2

Potential impacts to the Hockomock Swamp and Fowl Meadow ACEC would occur due to stormwater discharges to Black Brook and the East Branch of the Neponset River, respectively from the Stoughton and Whittenton Alternatives. However, minimal impacts to ACECs from stormwater discharges would occur from the project. None of the above-mentioned discharges are associated with constructed

stations, station platforms or parking areas. These discharges would primarily occur from conveyed overland flow from ditches along the railroad, which would carry negligible contaminant loads. None of the proposed actions are expected to impair surface or groundwater resources within the ACEC. Compliance with the Massachusetts Stormwater Management Standards is provided for all stations except Stoughton and Dana Street. Compliance would be documented for these stations (as necessary) during later project design phase phases.

Stoughton Electric Alternative

The Stoughton Electric Alternative would involve construction within one Zone A area, Zone II areas for six wells, and the IWPA for two wells. These areas would be disturbed only temporarily and would not receive any long-term impacts. This alternative would also require stormwater discharges to one Zone A area, Zone II areas for six wells, the IWPA for two wells, and 10 different waterbodies, including one ORW within the Hockomock Swamp ACEC and the East Branch of the Neponset River in the Fowl Meadow ACEC.

One new station, Easton Village Station, would be located in a Zone II area but would not have any impact on groundwater quality. With stormwater management measures in place, none of the stations or layover facilities is expected to impair any surface or groundwater resources.

While much of the rail corridor for this alternative already conveys diesel rail traffic under existing conditions, reconstructing the Stoughton Line south of Stoughton Station would reintroduce rail traffic to a historic rail corridor. However, the Stoughton Electric Alternative is not expected to contribute contaminants that would impair surface or groundwater resources. The proposed drainage design includes measures to control new potential pollutant sources and would meet Massachusetts Stormwater Management Standards. Specifically, the proposed conceptual drainage design would ensure that treatment trains are used at station sites that provide 80 percent Total Suspended Solids (TSS) removal and at least 44 percent TSS removal for discharges to Zones I, II and IWPA areas, as required by the Standards. Appropriate setbacks, volume controls and pretreatment requirements for these Zones and ORW's would be met. Consultation with DEP, the North Raynham Water District, and Easton Water Division during design would be undertaken during the design process. With mitigation and drainage features in place, the Stoughton Electric Alternative is not expected to impair any surface or groundwater resources.

Stoughton Diesel Alternative

The Stoughton Diesel Alternative would be comprised of the same elements as the Stoughton Electric Alternative as listed above and would have the potential to affect the same water resources. The Stoughton Diesel Alternative would have a slightly greater potential for pollutant loading due to the use of diesel fuel. Much of the rail corridor for this alternative already conveys diesel rail traffic under existing conditions; however, reconstruction of the Stoughton Line south of Stoughton Station would reintroduce rail traffic to a historic rail corridor. With mitigation and drainage features in place, the Stoughton Diesel Alternative is not expected to contribute contaminants that would impair surface or groundwater resources.

Whittenton Electric Alternative

The Whittenton Electric Alternative would involve construction within one Zone A area, the Zone I area for one well, Zone II areas for 10 wells, and the IWPA for two wells. These areas would be disturbed only temporarily and would not receive any long-term impacts. This alternative would also require

stormwater discharges to the Hockomock Swamp ACEC and the East Branch of the Neponset River in the Fowl Meadow ACEC.

However, this alternative would require stormwater discharges to one Zone A area, Zone II areas for 10 wells, the IWPA for two wells, and 11 different waterbodies. One new station, Easton Village Station, would be located in a Zone II area but would not have any impact on groundwater quality. With stormwater management measures in place, none of the stations or layover facilities is expected to impair any surface or groundwater resources.

While much of the rail corridor for this alternative already conveys diesel rail traffic under existing conditions, using the Whittenton Branch and reconstructing the Stoughton Line south of Stoughton Station would reintroduce rail traffic to a historic rail corridor. However, the Whittenton Electric Alternative is not expected to contribute contaminants that would impair surface or groundwater resources. The proposed drainage design includes measures to control new potential pollutant sources and would meet Massachusetts Stormwater Management Standards. With mitigation and drainage features in place, the Whittenton Electric Alternative is not expected to impair any surface or groundwater resources.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative would be comprised of the same elements as the Whittenton Electric Alternative as listed above and would have the potential to affect the same water resources. The Whittenton Diesel Alternative would have a slightly greater potential for pollutant loading due to the use of diesel fuel. Much of the rail corridor for this alternative already conveys diesel rail traffic under existing conditions; however, using the Whittenton Branch and reconstruction of the Stoughton Line south of Stoughton Station would reintroduce rail traffic to disused rail corridors. With mitigation and drainage features in place, the Whittenton Diesel Alternative is not expected to contribute contaminants that would impair surface or groundwater resources.

4.17.3.6 Mitigation

This section summarizes the avoidance, minimization, and mitigation measures proposed to protect and maintain water resources under each of the alternatives assessed in this report.

Avoidance

This section discusses steps taken to avoid impacts to water resources under each alternative. The Build Alternatives are discussed together due to their similar design methodology and construction requirements.

No-Build (Enhanced Bus) Alternative

The No-Build Alternative does not involve any construction or potential water resource impacts. The alternative uses existing bus routes and park-and-ride locations and has negligible potential for impacts to surface and groundwater resources.

Build Alternatives

The transit corridors selected for each Build Alternative were based on existing and former transit corridors such as the New Bedford Main Line and the Stoughton Line. Total avoidance of water

resources was not possible because these corridors have already been established and cross various surface and groundwater resources.

Stations and Layover Facilities

Where possible, new or reconstructed stations and new layover facilities were located away from waterbodies and drinking water protection areas. None of the stations or layover facilities are located in Zone I or Zone A areas, which require the greatest degree of protection from development in order to protect drinking water quality. However, the site selection for these facilities focused on locations that would enhance ridership and meet the operational requirements of the South Coast Rail alternatives.[25] Therefore, total avoidance of groundwater resources was not possible.

Minimization

Proposed station and parking facilities for all alternatives were located on developed sites whenever possible to minimize any increases in impervious area and to avoid introducing new pollutant sources to undeveloped areas. Additional minimization measures to reduce impervious surfaces such as deck parking, the use of water quality swales, narrower streets and green "islands”, a reduced building footprint, and alternative (permeable) materials for parking areas, sidewalks and roads at stations would be considered during the design stage of the project. Further minimization along the proposed transit corridors was not possible, as the corridors themselves were determined by existing and former highway and rail alignments and could not be relocated without substantial increases in impacts to other resources.

Specific Mitigation Measures

This section discusses mitigation measures required to protect water resources under each of the Build Alternatives. Most of these measures are common to multiple alternatives. Only a few select mitigation measures are presented due to the steps taken to minimize potential impacts such as the avoidance of stormwater discharges to sensitive resource areas (Zone I) and the minimization of discharges throughout the alternative project areas. All stormwater BMPs would meet or exceed regulatory requirements to suggest mitigation for potential impacts. These BMPs would be further refined during the design stage of the project.

Common to All Build Alternatives — Construction

Construction of the Build Alternatives would require a General Permit for Discharges From Construction Activities (effective February 16, 2012) would be required from the U.S. Environmental Protection Agency, pursuant to the National Pollutant Discharge Elimination System (NPDES). A comprehensive Stormwater Pollution Prevention Plan (SWPPP) would be a condition of the General Permit. The SWPPP would describe potential pollutant sources on a site and dictate what best management practices (BMPs) must be implemented to manage stormwater and protect water quality. Any soil-disturbing activities would require erosion and sediment controls, including proper timing of construction to minimize the time that an area is left exposed, temporary stabilization of exposed areas using protective covers, and perimeter controls to capture sediment before it leaves the site. Erosion and sedimentation controls are for use during the earthwork and construction phases of the project and may include

[25] Executive Office of Transportation and Public Works, South Coast Rail Station Siting Report: EOT’s Final Recommendations, October 10, 2008.

structural management practices such as hay bale barriers, silt fencing, compost mulch socks, catch basin inlet protection, gravel construction entrances, diversion channels, and temporary sedimentation basins. Non-structural management practices may include vegetative slope stabilization and construction sequencing. Daily monitoring would be performed to ensure that the controls are effective. Large areas of disturbance (such as at new station sites) could require temporary sedimentation basins.

Spill control procedures would be in place at designated fueling locations and temporary sanitary facilities to control any accidental spills of fuel or other hazardous materials. These locations would be isolated from surface waters and provided with spill-recovery equipment. Waste materials would be disposed of properly and not left in the open where they could contaminate soil or runoff.

Any dewatering activities for excavation, channel relocation, or fill would require proper handling of the dewatering discharge. To minimize dewatering discharges, the pump intake would be kept above the bottom of the excavation. Any contaminated dewatering discharge would be stored and disposed of in accordance with Massachusetts waste disposal standards in coordination with MassDEP. Uncontaminated water would be discharged to a vegetated land surface or pumped into an upland settling basin (or confined disposal facility) surrounded by hay bales or silt fences. Overflow water from the settling basin would be discharged into nearby waters of the United States in accordance with provisions of the Corps Section 404 permit, and the basin and all accumulated sediment would be removed following dewatering operations and the area would be seeded and mulched.

Common to All Build Alternatives—Stations

All proposed station sites would be designed to meet the Massachusetts Stormwater Management Standards (310 CMR 10.05(6)) and the proposed Massachusetts Stormwater Management Regulations (314 CMR 21.00). Together, these regulations require peak flow management as well as stormwater treatment such as removal of suspended solids.

Five stations require mitigation measures in order to comply with the Stormwater Standards. The BMPs incorporated into the design for these stations are summarized in Table 4.17-37, and include such LID and ESSD measures as vegetated swales, filter strips, bioretention swales, bioretention basins, and infiltration basins as well as structural BMPs such as oil/grit separators.

Table 4.17-37 Station Site Stormwater BMP Matrix

Station Name	Oil/Grit Separator	Vegetated Swale	Gravel & Grass Filter Strip	Bioretention Swale	Bioretention Basin	Infiltration Basin
North Easton Station	X	X			X	X
Raynham Park Station		X	X	X	X	
Taunton Station		X			X	
Taunton Depot Station		X			X	
Freetown Station		X				X
Fall River Depot Station	X					

Common to all Build Alternatives—Layover Facilities

The layover facilities would be regarded as Land Uses with Higher Potential Pollutant Loads (LUHPPLs) under the Stormwater Management Standards and would be held to a higher standard of treatment than the other elements of the project. The two overnight layover facilities have been designed with the appropriate BMPs to comply with the Stormwater Standards. The mitigation measures proposed for these facilities are summarized in Table 4.17-38, and include drip pans, oil/grit separators, vegetated swales, filter strips, and infiltration basins. A water quality manhole is proposed at the Wamsutta Layover Facility due to the unique constraints posed by this capped property.

Table 4.17-38 Layover Facility Stormwater BMP Matrix

Layover Facility Name	Drip Pan	Oil/Grit Separator	Vegetated Swale	Gravel & Grass Filter Strip	Water Quality Manhole	Infiltration Basin
Weaver's Cove East	X	X	X	X		X
Wamsutta	X	X	X		X	

Typical LID and infiltration-based stormwater management techniques may not be appropriate for the layover facilities due to their LUHPPL status, although open drainage systems may be possible for the access roads into the facilities. Closed or partially-closed drainage systems would be used to manage stormwater runoff within the site. The stormwater drainage would be designed to control runoff rates and maintain groundwater recharge. The only major potential pollutant source within the facilities would be locomotives in storage, which may drip small amounts of oil or other hazardous materials while in the facility. In addition to standard total suspended solids (TSS) removal BMPs for paved areas, the site would include specific drainage features to contain hazardous materials that may be encountered on the storage tracks. Drip trays and oil/water separators would be included in the layover facilities to capture and divert any pollutants that may collect under the locomotives. With these measures in place, the layover facilities are expected to satisfy the LUHPPL treatment requirement and meet the Stormwater Management Standards.

Build Alternatives

There are several mitigation measures that would be used along the rail lines and at the stations to prevent contamination of stormwater, groundwater, and waterbodies:

- The rail corridor would be supported by pervious ballast (or a trestle structure in some areas), which would have a minimal effect on stormwater drainage. Existing drainage ditches along the rail corridors would be improved, expanded, or relocated as needed to ensure proper drainage during storms. In accordance with the requirements of the Secretary's Certificate, drainage improvements would include specific measures to protect critical areas adjacent to the rail corridor. Detailed drainage plans for the entire project area would be completed in conjunction with final grading design. Locations where specific BMPs are recommended or required are identified below.

- Vegetated swales are proposed for use where the rail bed is in a cut or on a wide embankment with sufficient room to construct swales.

- Sediment forebays with checks dam are proposed for use at the downstream end of vegetated swales where flows are routed to a pipe for further conveyance, and at the downstream end of vegetated swales where flows are discharged to a wetland or other surface water.

- Underdrains with cleanouts are proposed for use where the right-of-way is too narrow to construct vegetated swales. In locations where underdrains are proposed in the vicinity of vernal pools, the elevation of seasonal high groundwater should be evaluated to ensure that underdrains do not inadvertently cause the vernal pool to drain prematurely.

- Stone-lined swales with HDPE liners are required for use near public water supply well Zone 1 areas, such as near the Easton GP Well #1 on Gary Lane in Easton. Lined swales are also required for use where drainage swales may intercept seasonally high groundwater in the vicinity of vernal pools. Interception of groundwater in these areas may cause pools to drain prematurely.

- Outlet scour protection is proposed for use where concentrated flow is discharged, typically pipe outlets with flared end sections or headwalls.

- Infiltration trenches are proposed for use to manage stormwater runoff associated with the Hockomock Swamp Trestle. Infiltration trenches would be constructed beneath the trestle at intervals to manage runoff from the overlying sections of trestle.

- The potential for creosote contamination from the rail ties can be reduced or eliminated by using alternative rail tie materials such as concrete wherever possible to avoid the need for creosote treatment. The South Coast Rail project has specified concrete ties as a standard element for new tracks. Wooden ties may be preferred at some turnouts, switches, special track work, and anywhere noise is a primary concern, as wooden ties usually result in quieter train operations than concrete ties.

- Rail greasers would be required at numerous curves in the track. Filter fabric would be placed atop the ballast at greaser locations to capture excess grease. This fabric would be replaced periodically in order to prevent excessive grease accumulation that could lead to stormwater or groundwater contamination.

- Herbicide would be used to keep the rail corridor free of intrusive and obstructive vegetation in order to ensure the stability of the railbed and the safety of trains. To minimize the potential for water quality impacts from herbicide use, an approved Vegetation Management Plan, as implemented with its Yearly Operating Plans would be adhered to which restrict the use of herbicides in areas adjacent to wetlands or sensitive resources.

- Traction power substations would be required along the rail line for the electrically-powered alternatives. To prevent potential water contamination from the oil in the transformers, these substations would be designed with secondary containment structures that would surround the equipment and contain any leaks or spills until the hazardous material could be collected.

- The sanitary tanks on the trains would be unloaded at the mid-day layover facility. The sanitary waste from the trains would not pose a risk to water resources under normal operations.

- Culverts would be evaluated for potential modification and upgrades to meet stream crossing standards and enhance wildlife, to the maximum extent practicable. All crossings would be evaluated. Where feasible, culverts would be replaced in-kind at stream crossings to prevent hydrologic changes to local streams, improve and restore fish and wildlife passing, decrease fragmentation of genetic pools, and improve connectivity between environmental resources. Design would be developed in consultation with DEP and the Corps and according to the Massachusetts River and Stream Crossing Standards.

Summary of Mitigation

All Build Alternatives would require stormwater management measures to prevent flooding and protect water quality. With the proposed mitigation measures in place, none of the Build Alternatives would be expected to substantially increase pollutant loading or impair any surface or groundwater resources.

4.17.3.7 Regulatory Compliance

Surface and groundwater resources are protected under several federal and state regulatory programs. This chapter documents how the proposed project complies with each water regulatory program.

Federal Regulations

Federal regulations related to stormwater and water quality include Sections 303(d), 311, and 402 of the Clean Water Act (33 U.S.C. 1251 et seq.) and the Safe Drinking Water Act (42 U.S.C. 300f et seq.).

Clean Water Act Section 303(d)

Section 303(d) of the Clean Water Act requires states, territories, and authorized tribes develop lists of impaired waters. These impaired waters do not meet the water quality standards that have been set for them, even after the minimum required levels of pollution control technology have been installed at point sources of pollution. The law requires that the jurisdiction establish priority rankings for waters on the lists and develop TMDLs for them. TMDLs identify the major contributors to a given impairment (e.g., sources within a watershed that may contribute to the contamination or impairment) and specifies both general and individual discharge limits that must be met in order to reduce contaminant loading and improve the health of the waterbody. If a project impacts a waterbody listed under the TMDL program, appropriate measures must be taken to control the discharge of the listed pollutant and meet the TMDL requirements. Some TMDLs may require additional measures (including stormwater treatment) in order to prevent an increase in pollutant loading to the receiving water.

Elements of the project are located within three watersheds with approved TMDLs; these watersheds are the Neponset River, Taunton River, and Buzzards Bay.[26,27,28] All of the project elements would be constructed to prevent the release of sanitary sewage into receiving waters, which is the major source

[26] MassDEP. 2009. *Final Pathogen TMDL for the Buzzards Bay Watershed* March 2009 (Control Number: CN 0251.1).
[27] MassDEP. 2011. *Final Pathogen TMDL for the Taunton River Watershed* June 2011 (Control Number: CN 0256.0).
[28] MassDEP. 2002. *Final Total Maximum Daily Loads of Bacteria for Neponset River Basin*. DEP, DWM TMDL Report MA73-01-2002. Control Number: CN 0121.0. May 31, 2002.

of bacteria or other pathogens that are the cause of the impairment under these TMDLs. As noted in the TMDL for the Taunton River watershed, "The expectation for WLAs [waste load allocations] and LAs [load allocations] for stormwater discharges is that they will be achieved through the implementation of BMPs and other controls." Filtration and infiltration practices are proposed at station sites and layover facilities with new impervious area. These BMPs would help to minimize bacteria loading from ambient sources such as birds and other wildlife. The project would not add any new sources of bacteria or other pathogens within the TMDL watersheds.

Clean Water Act Section 311

Section 311 of the Clean Water Act (40 CFR 112) regulates the prevention and response to accidental releases of oil and hazardous substances into navigable waters, on adjoining shorelines, or affecting natural resources belonging to or managed by the United States. As required under Section 311, an operational phase SPCC would be prepared prior to the commencement of operations at each layover facility.

Clean Water Act Section 402

Section 402 of the Clean Water Act regulates the discharge of pollutants to surface waters. Under the National Pollutant Discharge Elimination System (NPDES) program that is authorized by this section of the Clean Water Act, owners and operators of point source discharges and certain non-point discharges (such as stormwater runoff) are required to obtain a permit prior to discharging.

The South Coast Rail project would require authorization to discharge stormwater during construction under the NPDES General Permit for Construction Activities, administered in Massachusetts by the U.S. Environmental Protection Agency, and which regulates erosion control, pollution prevention, and stormwater management at construction sites over 1 acre. This permit would require a SWPPP that would specify proper stormwater management procedures for any disturbed areas. Construction period impacts to water quality would be reduced or eliminated through the use of appropriate BMPs. These BMPs would be documented in the SWPPP and would include perimeter sedimentation controls (silt fence, hay bales, filter berms, siltation booms), temporary stabilization of disturbed areas, and temporary siltation basins where appropriate. The SWPPP would be completed during the final design phase and must be implemented by the project contractor. Authorization to discharge stormwater under the General Permit for Construction Activities would be requested via a Notice of Intent prior to the commencement of construction.

In addition, the layover facilities would also require permission to discharge stormwater during operation. The NPDES Multi-Sector General Permit for Industrial Activities describes stormwater effluent limits, monitoring requirements and other conditions related to post-construction operations at the facilities. A site-specific SWPPP would be completed for each facility that provides an assessment of potential sources of pollutants in stormwater runoff and control measures that would be implemented at the layover facility to minimize the discharge of these pollutants in runoff from the site. These control measures include site-specific BMPs, maintenance plans, inspections, employee training, and reporting. Authorization to discharge stormwater under the Multi-Sector General Permit would be requested via a Notice of Intent prior to the commencement of operations at each facility.

Safe Drinking Water Act

The Safe Drinking Water Act authorizes the USEPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water. The South Coast Rail project would not impact public drinking water supplies and includes measures to prevent the release of contaminants in the vicinity of public water supplies.

State Regulations

The state applies regulatory measures pursuant to its authority under the Massachusetts Clean Waters Act (MGL Chapter 21, §26 53) and the Massachusetts Wetlands Protection Act (MGL Chapter 21, §26 53). Regulations promulgated under the Clean Waters Act include the Surface Water Quality Standards (314 CMR 4.00), Groundwater Quality Standards (314 CMR 6.00), and Section 401 Discharge regulations (314 CMR 9.00). Authority to regulate stormwater discharges is incorporated into the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.05) as the Massachusetts Stormwater Standards [310 CMR 10.05(6)(k)].

Massachusetts Surface Water Quality Standards (314 CMR 4.00).

The Massachusetts Surface Water Quality Standards (314 CMR 4.00) assign class designations to inland and coastal waters. These classes specify water quality standards based on the intended uses of the waterbodies and prohibit degradation of these waterbodies by new discharges. The South Coast Rail project does not include any new discharges that would impair the ability of a waterbody to meet its designated use. Comments on the DEIS/DEIR asked MassDOT to confirm the classifications for the waterbodies potentially affected by the project and to update the listing of impaired waters with the most recent Integrated List of Waters. Based on information published by MADEP on their website, none of the waterbody classifications were found to have changed since the DEIS/DEIR.

In addition to the water classifications in 314 CMR 4.00, MADEP also maintains the Massachusetts Integrated List of Waters, which is updated every 2 years and provides more detail on individual waterbodies. This list identifies what designated uses are attained, what impairments have been reported, and whether or not a TMDL has been prepared, if required. The TMDL program is part of Section 303(d) of the Clean Water Act and is also described above under Federal Regulations. Comments on the DEIS/DEIR asked MassDOT to update the listing of impaired waters with the most recent Integrated List of Waters. MADEP most recently published the Integrated List of Waters in 2010.[29] Only minor changes to waterbodies potentially affected by the project were noted when comparing the 2006 list to the 2010 list. These changes included an assessment of Forge Pond in Canton that indicated that the pond is impaired for turbidity (the pond was previously unassessed) and the approval of TMDLs for the Buzzards Bay and Taunton River Watersheds. As previously noted, these approved TMDLs address pathogens in discharges within the watershed.

Massachusetts Groundwater Quality Standards (314 CMR 6.00)

Compliance with the Stormwater Standards ensures that the project would not affect groundwater discharge that supports base stream flows, as well as protecting water quality. The South Coast Rail

[29] MassDEP. 2010. Massachusetts Year 2010 Integrated List of Waters, Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act, Featuring new water quality assessments for the Chicopee, French, Quinebaug and Nashua watersheds and the Narragansett Bay and Mount Hope Bay Coastal Drainage Areas.

project includes BMPs designed to promote recharge of groundwater to the maximum extent practicable. Pretreatment of runoff prior to recharge would ensure that groundwater quality is not impacted by the project.

Massachusetts Section 401 Discharge Regulations (314 CMR 9.00)

Section 401 of the Clean Water Act (33 U.S.C. 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the State in which the discharge originates or would originate, that the discharge would comply with the applicable effluent limitations and water quality standards. Under these regulations, the MassDEP is required to issue Water Quality Certifications for projects that result in discharge of fill to a wetland or waterbody, pursuant to the Massachusetts Clean Waters Act (MGL Ch. 21 § 26-53). The South Coast Rail project would require issuance of an individual Water Quality Certification as it would result in the loss of more than 5,000 square feet of wetlands subject to federal jurisdiction.

Massachusetts Stormwater Standards (310 CMR 10.05)

The Stormwater Standards consist of ten stormwater performance standards that were developed by the MassDEP to reduce the impacts of development on water quality. This section lists each of the Stormwater Standards and identifies how the South Coast Rail project would comply with each one. Supporting calculations documenting compliance with each standard are presented in Appendix 4.17-B (Stations), Appendix 4.17-C (Layover Facilities), and Appendix 4.17-A (Hockomock Swamp Trestle).

1. No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

- The South Coast Rail project has been designed to fully comply with Standard 1.
- BMPs proposed upgradient from any new discharge have been designed in accordance with the Massachusetts Stormwater Handbook and provide the required treatment volume.
- All proposed stormwater outlets and conveyances have been designed to not cause erosion or scour to wetlands or receiving waters. Outlets from closed drainage systems have been designed with flared end sections or headwalls with stone protection to dissipate discharge velocities. Overflows from BMPs that impound stormwater have been designed with stone to protect down gradient areas from erosion during large storm events.

2. Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

- The South Coast Rail project has been designed to fully comply with Standard 2.
- For each station site, layover facility, and structure with new impervious area, the rainfall-runoff response was analyzed under existing and proposed conditions for storm events with recurrence intervals of 2, 10, and 100 years. Stormwater BMPs with volume storage are proposed at each location where post-development peak discharges would require attenuation. In accordance with Standard 2, sites with discharges to coastal waters (Fall

River Depot Station, Battleship Cove Station, Whale's Tooth Station, Weaver's Cove East Layover Facility, and Wamsutta Layover Facility) may waive this standard and are not required to incorporate attenuation structures.

3. Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

- The South Coast Rail project has been designed to fully comply with Standard 3.
- ESSD techniques and LID features have been incorporated into the design of each station site and layover facility. ESSD techniques incorporated in the project include reducing impervious area by removing unnecessary pavement, maintaining existing drainage patterns, and maintaining existing mature vegetation. LID features include disconnecting runoff from impervious surfaces, using sheet flow and surface conveyances as opposed to closed drainage systems, promoting groundwater recharge through bioretention and infiltration basins.
- Groundwater recharge requirements have been met for each project element.

4. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when (1) Suitable practices for source control and pollution prevention are identified in a long- term pollution prevention plan, and thereafter are implemented and maintained; (2) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and (3) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

- The South Coast Rail project has been designed to fully comply with Standard 4.
- Structural practices such as deep sump catch basins with hoods, oil/grit separators, gravel and grass filter strips, vegetated swales, and sediment forebays have been incorporated as appropriate in each site design in order to provide pretreatment of stormwater flows. Bioretention swales, bioretention basins, and infiltration basins have been incorporated as appropriate in each site design to provide treatment that meets or exceeds the 80 percent TSS removal requirement.
- The only location where the water quality volume and 80 percent TSS removal requirement could not be met was along the Hockomock Swamp Trestle. As described in Section 4.17.3.3, runoff from the trestle would be treated to the extent practicable and meets all of the requirements of the *de minimis* standard described in Volume 3 of the Massachusetts Stormwater Handbook.
- In order to comply with the on-going requirements of this standard, a long-term pollution prevention plan would be required as part of final design.

5. For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, MGL c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

- The South Coast Rail project has been designed to fully comply with Standard 5.
- Three elements of the project qualify as LUHPPLs: North Easton Station, Weaver's Cove East Layover Facility, and Wamsutta Layover Facility. In accordance with the requirements of Standard 5, these sites incorporate specific structural stormwater BMPs such as deep sump catch basins with hoods, oil/grit separators and sediment forebays. The layover facilities also incorporate drip pans beneath the layover tracks to catch drips or spills from the trains stored at the facility.
- Appropriate source control and pollution prevention measures must be documented in a post-construction SWPPP. This plan would be completed in conjunction with the Notice of Intent for authorization under the NDPES Multi-Sector General Permit, prior to stormwater discharges from the layover facilities.

6. Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area, if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

- The South Coast Rail project has been designed to fully comply with Standard 6.
- Stormwater discharges to ORWs would receive treatment and would be set back from the receiving water to the maximum extent practicable. Discharges to ORWs are limited to locations along the Hockomock Swamp Trestle and along track segments located near vernal pools. Typical details for stormwater treatment measures are described in Section 4.17.3.3. No discharges are proposed within a Zone 1 or Zone A of a public water supply.
- Selection of appropriate treatments for each location would occur during final design as part of detailed grading plans and drainage analysis.

7. A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

- The South Coast Rail project has been designed to fully comply with Standard 7.
- According to the guidance in the Massachusetts Stormwater Manual, all of the station sites, except for North Easton Station, Taunton Depot Station, Freetown Station, and both of the layover facilities, qualify as redevelopment projects. Redevelopment of station sites where new parking lots are proposed (Raynham Park and Taunton) have been designed to fully comply with all of the Stormwater Standards. The Weaver's Cove East Layover Facility has also been designed to fully comply with all of the Stormwater Standards.

8. A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

- The South Coast Rail project would fully comply with Standard 8.
- The project would obtain coverage under the NPDES Construction General Permit prior to the start of earthmoving activities. A construction-period SWPPP would be developed during final design as part of the Notice of Intent submittal. Recommended construction period BMPs have been described in the DEIS/DEIR.

9. A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

- The South Coast Rail project would fully comply with Standard 9.
- MassDOT would develop a detailed O&M Plan during final design as part of the Notice of Intent submittal.

10. All illicit discharges to the stormwater management system are prohibited.

- The South Coast Rail project would fully comply with Standard 10.
- Proposed stations and layovers have been designed so that they are in full compliance with current standards. In locations where previous development has occurred, storm drainage structures remaining from those developments would be removed within the redevelopment area. New sanitary facilities at the two layover facilities would be designed in accordance with the sanitary code.
- No statement is made with regard to existing drainage systems in portions of project sites which are not included in the redevelopment project area.

4.18 COASTAL ZONE AND CHAPTER 91

4.18.1 Introduction

This chapter identifies the potential impacts that may result from implementation of each of the proposed South Coast Bail Alternatives (see Figure 4.18-1 and Figure 4.18-2 for illustrations of the Stoughton Alternative and the Whittenton Alternative, respectively) to coastal zone resources and jurisdictional tidelands and navigable rivers and streams. Coastal zone resources are those identified in the Coastal Zone Management Act (CZMA) of 1972, as amended (16 U.S.C. 1451 et seq.), which provides for management of the nation's coastal resources and balances economic development with environmental conservation. Resources addressed under the CZMA include coastal development, water quality, public access, habitat protection, energy facility siting, ocean governance and planning, coastal hazards, and climate change.

The Massachusetts Coastal Zone Management Plan and regulations implement the federal CZMA. The Massachusetts Coastal Zone Management Act (MGL Chapter 21A, Sections 2 and 4A) established local authority to implement the Massachusetts Coastal Zone Management Plan (CZMP) through regulations at 301 CMR 20.00 through 301 CMR 25.00. This chapter assesses the consistency of the South Coast Rail project with the Massachusetts Coastal Zone Management Program (MCZMP) in accordance with regulations at 301 CMR 21.00 (federal consistency certification).

This chapter also assess impacts to tidelands and navigable rivers and streams subject to jurisdiction under M.G.L) Chapter 91, as implemented by 310 CMR 9.00 (collectively Chapter 91). Chapter 91 seeks to preserve and protect the rights of the public, and to guarantee that private uses of tidelands and waterways serve a proper public purpose. In addition to the state-level Chapter 91 requirements, Section 10 of the Rivers and Harbors Act also provides federal (USACE) jurisdiction over alterations to navigable waters of the United States.

This chapter includes descriptions of each resource, the regulatory context and significance of each, and a description of the existing resources present within the project area potentially affected by the alternatives.

Work required to implement the project within the jurisdiction of MGL Chapter 91 and the Massachusetts Coastal Zone includes track and signal system upgrades, bridge and abutment replacement, construction of stations and layover facilities. As each alternative may require some approvals within each of these jurisdictions, depending on MassDEP determinations, the following sections summarize the potential regulatory approvals and describe potential effects to Chapter 91 resources and the Massachusetts Coastal Zone.

Coastal zone and Chapter 91 resources are depicted in Figures 4.18-3 through 4.18-19. These figures illustrate the alignment alternatives from the Canton Junction Station in the north to Fall River and Bedford in the south.

The Secretary's certificate on the DEIR included the following requirements related to coastal zone:

- [For layover facilities] "Consistency with Chapter 91 licensing requirements and requirements for location within a Designated Port Area (DPA) should be described as applicable. The FEIR should clarify whether any facility located in a DPA can be allowed as a temporary and/or supporting DPA use."

- "The FEIR should clarify, and depict on figures/plans, any filled or flowed tidelands on or near the proposed layover facilities. Where applicable, information to support a Public Benefit Determination should be included."

- "The FEIR should include measures [at the proposed Whale's Tooth Station] to avoid and minimize non-point source pollution from idling trains and describe how the station site will be designed to be compatible with existing industrial uses in the New Bedford/Fairhaven Designated Port Area (DPA)."

- "The Wamsutta layover alternative is located adjacent to the Whale's Tooth Station site and the DPA. The FEIR should address compatibility issues with regard to coastal zone protection and DPA uses as recommended by CZM."

- "The proposed stations in Fall River are located near the Mount Hope Bay DPA and the Fall River station is partially located within the coastal zone. ... In consideration of sea level rise, the FEIR should consider a margin of safety to avoid a facility being located in a future elevated Zone A floodplain."

- "The FEIR should address pollution prevention and low impact development at all station and layover sites as well as project consistency with DPA uses and the Fall River City's harbor planning goals for pedestrian reconnection to the Waterfront."

- "MassDOT should consult with MassDEP and provide more detailed plans to determine whether or not the filled tidelands at Fall River Battleship Cove Station, New Bedford Whale's Tooth Station, and Wamsutta Layover facility are considered landlocked tidelands as defined at 301 CMR 9.02."

- "The FEIR should include analysis and mitigation as applicable to support a Public Benefits Determination consistent with Chapter 168 of the Acts of 2007."

- "The FEIR should describe any public access restrictions to the shoreline that may result from construction of layover facilities or other components of the proposed project."

- "Mitigation plans should be included in the FEIR to compensate for any public access impacts."

- "The FEIR should include detailed information describing the nature of the tidelands affected and the public benefits of the proposed project in accordance with the Public Benefits Determination Requirements at 301 CMR 13.00."

- "MassDOT should consult with DEP concerning the layover facility at Weaver's Cove [relative to filled tidelands] and provide DEP with the information outlined in its comment letter."

- "The FEIR should include an update on consultations and jurisdictional determinations."

- "The FEIR should identify and describe all components of the project requiring Chapter 91 licensing and whether project components are considered water-dependent or non-water dependent."

- "The FEIR should describe in detail how the project will meet licensing standards."
- "The FEIR should explain how the project is consistent with the New Bedford and Fall River Municipal Harbor Plans pursuant to 310 CMR 9.34, including how intermodal connections to the ferry service would be achieved."
- "The FEIR should explain how railroad components subject to licensing will preserve or enhance navigational capacity and maintain or enhance public access pursuant to 310 CMR 9.35 and 9.36."
- "If navigation or public access is impacted by the project, the FEIR should include detained mitigation plans."
- "The FEIR should explore opportunities on or near the layover facilities where MassDOT can 'take reasonable measures to provide open space for active or passive recreation at the water's edge'."

4.18.2 Regulatory Framework

4.18.2.1 Coastal Zone Management

Section 307(c) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)) requires federal agencies conducting activities, including development projects, directly affecting a state's coastal zone, to comply to the maximum extent practicable with an approved state coastal zone management program. The Act also requires any non-federal applicant for a federal license or permit to conduct an activity affecting land or water uses in the state's coastal zone to furnish a certification that the proposed activity will comply with the state's coastal zone management program. Generally, no permit will be issued until the state has concurred with the non-federal applicant's certification.

The Massachusetts Coastal Zone Management Program (MCZMP) is the state-delegated authority established by the Federal Coastal Zone Management Act of 1972. Massachusetts General Law Chapter 21, Sections 2 and 4A establishes the Commonwealth's authority to require a Federal Consistency Certification (Coastal Zone Consistency) for certain projects requiring federal action that can reasonably be expected to affect the resources or land or water uses of the Massachusetts Coastal Zone. Certification is obtained through agency confirmation that projects subject to review are consistent with the regulatory policies and management principles established by the approved Massachusetts Coastal Zone Management Program. State agency certification is required prior to federal actions by the Department of the Army under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.

The MCZMP has the jurisdictional mandate to review activities in accordance with the Massachusetts Coastal Zone Management Regulations at 301 CMR 21.00 for consistency with the program policies enumerated in the regulations at 301 CMR 21.98 and the MCZMP. The geographic scope of this program is the Massachusetts Coastal Zone established by 301 CMR 21.99, 1972, as amended (16 U.S.C. 1451 et seq.) and 15 CFR 930, as amended. The Coastal Zone Management Program also protects the limited capacity to site water-based industrial and other maritime facilities within previously developed port areas.

The Massachusetts Coastal Zone includes the entire Massachusetts coastline extending from the seaward limit of state jurisdiction to point 100 feet landward of the first major transportation infrastructure adjacent to the coast. The precise boundary is defined by the regulations at 301 CMR 21.00 (Coastal Zone Management Program Federal Consistency Review Procedures). The Federal Coastal Zone Management Act requires state certification that applicable projects requiring federal actions are consistent with the approved coastal zone management plan. Federal consistency certification of the project is required prior to issuance of a Department of the Army permit.

Coastal Zone limits presented in this chapter were determined using GIS data provided by MassGIS. The Coastal Zone limits are illustrated on Figures 4.18-11 through 4.18-19. Section 4.18.6 demonstrates the project's consistency with the MCZMP.

4.18.2.2 Section 10 of the Rivers and Harbors Act of 1899.

Section 10 of Rivers and Harbors Appropriation Act of 1899, (33 U.S.C. 403) requires a Department of the Army permit for structures and/or work in or affecting navigable waters of the United States. In the case of South Coast Rail, the Taunton River is a tidal navigable water of the United States up to the South Street East Bridge in Taunton, and the Mill River in Taunton is navigable to Spring Street in Taunton. Should the South Coast Rail proposal involve any placement of structures or work (except bridges) in or affecting the Taunton or Mill Rivers, it will be necessary for MassDOT to obtain Department of the Army authorization under Section 10, in addition to the authorization to discharge dredged or fill material under Section 404 of the Clean Water Act.

In addition, Section 9 of Rivers and Harbors Appropriation Act of 1899, (33 U.S.C. 401) prohibits the construction of any dam or dike across any navigable water of the United States in the absence of Congressional consent and approval of the plans by the Chief of Engineers and the Secretary of the Army. Section 9 also pertains to bridges and causeways but the authority of the Secretary of the Army and Chief of Engineers with respect to bridges and causeways was transferred to the Secretary of Transportation under the Department of Transportation Act of October 15, 1966. As of that date, the construction or alteration of any bridge across any navigable water of the United States requires a permit from the U.S. Coast Guard. Therefore, it will be necessary for MassDOT to obtain a bridge permit from the U.S. Coast Guard for alteration or replacement of the bridge crossings over the Taunton River for the Whittenton Alternative, and over both the Taunton and Mill Rivers for the Stoughton Alternative. The Whittenton route also crosses the Mill River; however, that crossing is located well upstream of its navigable limits, and therefore a bridge permit from the U.S. Coast Guard would not be required for the Whittenton route crossing of the Mill River).

The Corps does not have authority over bridges under Sections 9 or 10 of the Rivers and Harbors Act of 1899. Corps authority over bridges is limited to appurtenant structures such as abutments and bank stabilization, the construction of which may involve discharges of dredged or fill material, and as such are regulated under Section 404 of the Clean Water Act.

4.18.2.3 Chapter 91–Waterways Regulations

Massachusetts General Law Chapter 91 is the modern codification of a series of statues which preserve certain rights in tidelands for the citizens of the Commonwealth. These rights date to the Massachusetts Colonial Ordinances of 1641-1647 and preserve the rights of the public to fish, fowl and navigate within all tidal waters of the Commonwealth up to and including the natural high water mark. With relatively

few legislative exceptions, these rights are preserved in perpetuity for the citizens of the Commonwealth.

Compliance with Chapter 91 is administered by the Massachusetts DEP through the Waterways Regulations at 310 CMR 9.00. These regulations establish procedures for the issuance of licenses for activities and structures located within jurisdictional areas. Maintenance, repair and minor modifications to existing, authorized structures within a jurisdictional area may be permitted without a new license or license amendment under the procedures at 310 CMR 9.22.

As it relates to this project, Chapter 91 jurisdiction potentially extends to four key components:

- non-tidal rivers and streams;
- tidal waters (flowed tidelands);
- filled tidelands; and
- landlocked tidelands.

4.18.2.4 Non-Tidal Rivers and Streams

The Waterways Regulations at 310 CMR 9.04(1)(e) establish Chapter 91 jurisdiction over the following:

> (e) any non-tidal river or stream on which public funds have been expended for stream clearance, channel improvement, or any form of flood control or prevention work, either upstream or downstream within the river basin, except for any portion of any such river or stream which is not normally navigable during any season, by any vessel including canoe kayak, raft or rowboat; The Department [DEP] may publish, after opportunity for public comment and review, a list of navigable streams and rivers….

This regulation establishes Chapter 91 jurisdiction over any navigable river or stream to which public funds have been expanded. To date, the Massachusetts DEP has not published a list of navigable rivers and streams in the Commonwealth, and neither MassDOT nor MassDEP is aware of a definitive list of non-tidal rivers and streams upon which public funds have been spent. In the absence of such a list, MassDEP states in their comment letter on the DEIS/DEIR:

"As a general rule … only the non-navigable uppermost reaches of a river basin are not subject to review."

Therefore, in order to determine the jurisdictional status of non-tidal rivers and streams, this evaluation considered the potential navigability of each river, stream, or wetland crossing within the rail corridor. The following materials were relied upon in assessing navigability:

- Stream order as determined by reference to USGS maps and "StreamStats;" using the Strahler method;
- Presence of a defined channel upstream and/or downstream of the crossing;
- Upstream and downstream conditions in terms of density of vegetation or the presence of culverts or other obstructions to navigation;

- Available survey data; and
- Field observations.

Existing and planned transportation improvements within areas potentially subject to jurisdiction under Chapter 91 pursuant to 310 CMR 9.04 were reviewed and preliminary determinations made regarding jurisdiction. These preliminary determinations are based in part on written and verbal guidance provided by MassDEP. MassDEP has the sole authority for making such determinations under Chapter 91.

4.18.2.5 Tidal Waters (Flowed Tidelands)

The Massachusetts Waterways Regulations at 310 CMR 9.02 define Flowed Tidelands as "…present submerged lands and tidal flats which are subject to tidal action." Flowed tidelands presented in this chapter are based on GIS data provided by MassGIS and Massachusetts DEP.

4.18.2.6 Filled Tidelands

The Massachusetts Waterways Regulations at 310 CMR 9.02 define filled tidelands as "former submerged lands and tidal flats which are no longer subject to tidal action due to the presence of fill."

The jurisdictional boundaries of filled tidelands are defined by the Historic High Water Mark, which is defined by 310 CMR 9.02 as:

> The high water mark which existed prior to human alteration of the shoreline by filling, dredging, excavating, or other means. In areas where there is evidence of such alteration by fill, the Department shall presume the historic high water mark is the farthest landward former shoreline which can be ascertained with reference to topographic of hydrographic surveys…

Filled tidelands presented in this chapter are based on GIS data provided by DEP.

4.18.2.7 Landlocked Tidelands

The Waterways Regulations define landlocked tidelands in 310 CMR 9.02 as:

> Any filled tidelands which on January 1, 1984 were entirely separated by a public way or interconnected public ways from any flowed tidelands, except for that portion of such filled tidelands which are presently located:
>
> (a) within 250 feet of the high water mark, or
>
> (b) within any Designated Port Area. Said public way or ways shall also be defined as landlocked tidelands, except for any portion thereof which is presently within 250 feet of the high water mark.

4.18.2.8 Designated Port Areas

The Chapter 91 and Coastal Zone Programs overlap in the case of nonwater-dependent use projects and activities proposed within Designated Port Areas (DPA) established by 301 CMR 25.00. New nonwater-dependent use projects are not permitted within DPAs except on a limited basis and without significant

detriment to the capacity of the DPA to accommodate water-dependent industrial uses in the future [310 CMR 9.32(b)]. More information regarding DPAs is provided in the Coastal Zone Management section of this chapter.

4.18.2.9 Chapter 91 Licensing Requirements

Chapter 91, Section 12A authorizes DEP to license and prescribe the terms for the construction or extension of a dam, road, bridge or other structure, or the filling of land, the driving of piles, or the making of excavations, in, over or upon the waters below high water mark of any river or stream within the commonwealth with respect to which expenditures from federal, state or municipal funds have been made for stream clearance, channel improvement or any form of flood control or prevention work, and the provisions of this chapter shall apply to all such licenses."

Massachusetts General Law Chapter 91, Section 18B as established by the Statute 2007, Chapter 168, Section 8 reaffirms this exception from licensing for filled tidelands and requires the Secretary for Energy and Environmental Affairs to issue a Public Benefit Determination for projects in landlocked tidelands within 30 days of the issuance of a final MEPA certificate pursuant to 301 CMR 13.00.

The Waterways Regulations do not require a new license or license amendment for the continued use, maintenance or minor modifications to existing, authorized fill or structures within jurisdictional areas, provided that the proposed work does not include a substantial enlargement of the existing structures or fill and the structures have been in existence since January 1, 1984.

The jurisdictional resources are further described below. New nonwater-dependent use projects are permitted on a limited basis within Designated Port Areas (DPA) if, among other instances, the project constitutes a supporting DPA use as defined at 310 CMR 9.02 as pursuant to the waterways regulations at 310 CMR 9.32(1) (b) (4). Furthermore, as confirmed by MassDEP in their comment letter on the Draft EIS/EIR, "replacement, reconstruction or other modification" to existing railroad beds is allowed, even in a Designated Port Area, provided there is limited net encroachment per 310 CMR 9.31(2)(b) and (c). A detailed description of DPAs is provided later in this chapter.

In the case of landlocked tidelands, no license is required under 310 CMR 9.00, but the Secretary for Energy and Environmental Affairs is required to issue a Public Benefits Determination under 301 CMR 13.00.

The Waterways Regulations require a license for all construction activities, placement of fill and changes in use within present and former tidelands and the navigable portions of non-tidal rivers and streams when such streams have been improved through the expenditure of public funds for stream clearance, channel improvement or flood control upstream or downstream of the proposed work. The DEP, following review of a completed application and plans and a public comment period, issues licenses for proposed construction, placement of fill or changes in use. The proposed project is regulated under Chapter 91 as an infrastructure crossing facility. The regulations at 310 CMR 9.12 require the Secretary of Energy and Environmental Affairs to make a determination of water dependency for the project. Such a finding of water dependency is anticipated for the bridges based on geography alone.

Any project element requiring a new license must meet the applicable basic requirements established by 310 CMR 9.32 through 9.54. Table 4.18-1 lists the basic licensing requirements.

Table 4.18-1 Compliance with Basic Requirements Listed in 310 CMR 9.31(1) for Non-Tidal Rivers and Streams

Requirement in 310 CMR 9.31(1)	Referenced Regulation	Requirement Description	Standard	Applicability / Compliance
(a)	310 CMR 9.32	Categorical restrictions on fill and structures	No new fill is permitted in flowed tidelands for non-water dependent use projects.	All existing and proposed crossings are water dependent infrastructure crossing facilities pursuant to 310 CMR 9.02 and 310 CMR 9.12(2)(d).)
(b)	310 CMR 9.33	Environmental protection standards	Projects must comply with all applicable state environmental protection requirements.	The project would obtain all required state and federal permits and approvals.
(c)	310 CMR 9.34	Conformance with municipal zoning and harbor plan	Projects must comply with applicable local zoning.	MassDOT is not subject to local zoning.
			Projects must comply with applicable Municipal Harbor Plans (MHP)	The project complies with the plans and recommendations of the approved New Bedford/Fairhaven MHP as described in Section 4.18.6.5. The project is consistent with the Fall River Harbor and Downtown Economic Development Plan as described in Section 4.18.6.5.
(d)	310 CMR 9.35(2)	Standards to preserve water-related public rights: Public Rights Applicable to All Waterways	This standard prohibits projects from significantly interfering with: Public rights of navigation which exist in all waterways; Free passage over and through the water; and Access to town landings.	Existing culverts crossing non-tidal rivers and streams provide limited navigation. The existing bridges are generally licensed structures and provide passage for small vessel navigation. Proposed culvert and bridge improvements would maintain or enhance existing navigability at jurisdictional crossings. Table 4.18-2 lists individual non-tidal river and stream crossings and describes the potential effect on public rights to navigation and free passage over and through the water.

Requirement in 310 CMR 9.31(1)	Referenced Regulation	Requirement Description	Standard	Applicability / Compliance
(d)	310 CMR 9.35(3)	Standards to preserve water-related public rights: Public Rights Applicable to Tidelands and Great Ponds	Projects "shall not significantly interfere with public rights of fishing and fowling which exist in tidelands and Great Ponds…" Projects shall not significantly interfere with on-foot passage and in the case of non-water dependent use projects shall include accommodations for public access across the site.	The project does not include any work within existing flowed tidelands or Great Ponds and therefore would not interfere with such public rights.
(d)	310 CMR 9.35(4)	Compensation for Interference with Public Rights in Commonwealth Tidelands and Great Ponds	Any water dependent use projects which include fill or structures for private use of Commonwealth tidelands shall provide compensation to the public for interfering with its broad rights to use such lands for any lawful purpose.	The project is a public infrastructure project as defined at 310 CMR 9.02 and therefore does not include any fill or structures for private use of Commonwealth Tidelands of Great Ponds.
(d)	310 CMR 9.35(5)	Management of Areas Accessible to the Public	Any project which includes tidelands or Great Ponds accessible to the public shall provide for long-term management of such areas which achieves effective public use and enjoyment while minimizing potential conflicts with other legitimate uses.	The project does not include any tidelands or Great Ponds accessible to the public.
(e)	310 CMR 9.36(1)	Standards to protect water-dependent uses	The Project shall preserve the availability and suitability of tidelands, Great Ponds and other waterways that are in use for water-dependent purposes, or which are reserved primarily as locations for maritime industry or other specific types of water-dependent use.	See 310 CMR 9.36(2) through (5) below

Requirement in 310 CMR 9.31(1)	Referenced Regulation	Requirement Description	Standard	Applicability / Compliance
(e)	310 CMR 9.36(2)		The project shall not significantly interfere with littoral or riparian property owners' rights to approach their property from a waterway and to approach the waterway from said property.	The project does not include any new non-tidal river and stream crossings and would therefore not significantly interfere with any littoral or riparian property owners' rights of access. Existing crossings would be maintained or upgraded to support passenger rail traffic. Where feasible, upgrades will widen culverts to improve wildlife passage resulting in a net benefit to navigation.
(e)	310 CMR 9.36(3)		The project shall not significantly disrupt any water-dependent use in operation, as of the date of license application, at an off-site location proximate to the vicinity of the project site.	The project would enhance the capacity for the existing water-dependent infrastructure crossing facilities to support public transportation and this public service project.
(e)	310 CMR 9.36(4)		The project shall not displace any water-dependent use that occurred on the site within the last five (5) years.	The existing railroad crossings are all located on land owned and/or operated as a railroad for many years. The project would restore, maintain or enhance these existing water-dependent infrastructure crossing facilities only water dependent use.

A determination of water dependency is an important part of demonstrating the project's compliance with Chapter 91 because water-dependent use projects are presumed to meet the proper public purpose requirement and may allow DEP to issue individual licenses without a public hearing, if appropriate, expediting the approval process in these instances.

Many of the existing bridges and track over non-tidal rivers and streams lack existing licenses for one of three reasons:

- The waterbody is not subject to Chapter 91 and therefore no license is required;
- The bridge and associated fill and structures were authorized by act of the Massachusetts General Court in chartering the original railroad;
- They were built prior to the promulgation of 310 CMR 9.00 and did not require a license.

The regulations at 310 CMR 9.22 provide a regulatory mechanism to authorize several categories of maintenance, repair and minor modification to existing authorized structures since January 1, 1984. These are:

- **Maintenance and Repair**–defined by 310 CMR 9.22(1) as including but not limited to: replacement of railroad track, stabilization of road or rail beds, reconstruction of culverts and catch basins, and other maintenance or repair of existing public transportation facilities and associated drainage systems, as necessary to preserve or restore the serviceability of such facilities for the original use, provided that maintenance and repair shall not include substantial enlargement of such facilities, such as roadway widening, adding shoulders, or upgrading intersections.

This is interpreted to mean that repair, replacement and maintenance activities may be permitted to restore the serviceability of the tracks, bridges, culverts, etc. provided the work does not include addition of new tracks within the jurisdictional area not contemplated by the original license.

- **Minor Project Modification**–defined by 310 CMR 9.22(3) to include: Structural alterations which are confined to the existing footprint of fill and structures being altered and which represent an insignificant deviation from the original license specifications in terms of size, configuration, materials or other relevant design or fabrication parameters.

In the case of authorized jurisdictional crossings that are determined by DEP to be jurisdictional, minor modifications may typically be obtained for work that a) reduces or maintains the footprint of existing fill or structures; and b) maintains or increases the space available for navigation.

4.18.2.10 Designated Port Areas

The 1978 MCZMP identified twelve Designated Port Areas (DPA) within existing developed harbors in Massachusetts coastal communities. The stated purpose for identifying these areas was to establish specific developed ports that are uniquely suited to host marine-based commercial and industrial activities.

The MCZMP establishes state policies recognizing the unique characteristics of the designated port areas and seeks to protect them from pre-emption by uses that are nonwater-dependent uses through the

federal consistency certification process created by the MCZMP and the standards for nonwater-dependent use projects subject to Chapter 91. The regulations at 301 CMR 25.00 formalize the boundaries of the DPAs and establish specific procedures for periodic review and adjustment. There have been several adjustments to the DPAs since 1978, including the elimination of the Plymouth Cordage DPA and other changes.

The Chapter 91 and Coastal Zone Programs overlap in the case of nonwater-dependent use projects and activities proposed within Designated Port Areas (DPA) established by 301 CMR 25.00. Nonwater-dependent use projects are not permitted within DPAs except on an interim basis without significant detriment to the capacity of the DPA to accommodate water-dependent industrial uses in the future.

The location of Chapter 91 resources, Massachusetts Coastal Zone and Designated Port Areas used in this chapter were provided by MassGIS, Massachusetts DEP and Massachusetts Office of Coastal Zone Management.

4.18.3 Existing Conditions

4.18.3.1 Non-Tidal Rivers and Streams

The jurisdictional review of non-tidal rivers and streams conducted for this FEIS/FEIR considered all culvert and bridge crossings in the project corridor to confirm the presence of a watercourse at each crossing. There are 139 bridges or culverts along the corridor. Culverts that convey drainage under public roads, stormwater in upland areas, and drainage parallel to the tracks were eliminated from further review because they have no potential for navigability. After eliminating these from consideration, 42 crossings of rivers and streams along the right-of-way were considered further for potential Chapter 91 jurisdiction. Table 4.18-2 lists the 42 crossings and provides the rationale for the Chapter 91 jurisdictional determination. Based on this analysis, there are 24 Chapter 91 jurisdictional waterway crossing locations, consisting of 15 bridges and 9 culverts. Figures 4.18.3 through 4.18.19 show the locations of these structures as well as the 25 structures not subject to Chapter 91 licensing.

4.18.3.2 Tidal Waters (Flowed Tidelands)

No work for the South Coast Rail project is proposed within flowed tidelands.

4.18.3.3 Filled Tidelands

The South Coast Rail project includes the reconstruction of track, ballast, bridges and culverts within filled tidelands and the construction of two new stations and two layover facilities within filled tidelands. The location and extent of filled tidelands relative to the South Coast Rail project elements was determined by mapping the historic mean high water mark generated by the Massachusetts Chapter 91 Mapping Project as distributed by MassGIS.

Table 4.18-2 Chapter 91 Jurisdictional Status of Non-Tidal River and Stream Crossings

Milepost	Identification	Town	Name of Waterbody	Stream Order	Description	Potentially Navigable	Rationale
Stoughton Line							
0.87	Undergrade bridge for Forge Pond	Canton	Pequit Brook	3	Pond connector for Forge Pond and Kingsley Pond.	YES	stream order, horizontal and vertical clearance
1.64	Undergrade bridge for Beaver Meadow Brook [Mill Brook]	Canton	Beaver Meadow Brook	3	Perennial stream flowing east to west, connecting Beaver Meadow Brook to ponds.	YES	stream order, horizontal and vertical clearance
4.47	CV-ST 4.47	Stoughton	Unnamed tributary	1	Intermittent stream flowing east to west in developed area.	NO	dense vegetation beyond culvert upstream
6.80	Undergrade bridge for Cowessett Brook [Whitman Brook]	Easton	Whitman Brook	2	Perennial stream flowing west to east in rural area.	YES	stream order, horizontal and vertical clearance
7.23	CV-ST 7.23	Easton	Unnamed tributary to Whitman Brook	2	Intermittent stream flowing west to east in rural area.	NO	narrow shallow channel downstream and downstream precludes navigation
7.42	CV-ST 7.42	Easton	Unnamed tributary to Whitman Brook	1	Intermittent stream flowing west to east in suburban area.	NO	upstream ponding at the culvert provides limited open water, upstream channel small and shallow, downstream flow is diffuse with no defined channel
7.95	Undergrade bridge for Small Creek [Quesset Brook at Shovel Shop Pond] BRIDGE E-06-032	Easton	Quesset Brook	3	Perennial stream flowing west to east in urban area.	NO	while bridge provides adequate clearance and likely > 6 in water depth (annually), adjacent culverts downstream preclude navigation
10.95	CV-ST 10.95	Easton	Black Brook	2	Perennial stream flowing west to east in rural area.	YES	stream order and presence of open water, channel
	Undergrade bridge for Black Brook	Easton	Black Brook	2	Perennial stream flowing west to east in rural area.	YES	stream order and presence of open water, channel

Milepost	Identification	Town	Name of Waterbody	Stream Order	Description	Potentially Navigable	Rationale
11.44	CV-ST 11.44	Easton	Unnamed tributary to Black Brook	1	Wetland equalizer in rural area.	NO	narrow stream across golf course
11.59	CV-ST 11.59	Easton	Unnamed tributary to Black Brook	2	Wetland equalizer in rural area.	YES	navigable channel beyond track ballast and culvert
11.91	CV-ST 11.91	Easton	Stream Not Shown On USGS, StreamStats	1	Intermittent stream flowing east to west in rural area.	NO	dense vegetation and very shallow stream channel preclude navigation
12.68	CV-ST 12.68	Easton	Black Brook	3	Perennial stream flowing west to east in rural area.	Potentially navigable, very shallow.	Stream order, wide channel
16.00	CV-ST 16.00	Raynham	Unnamed tributary to Pine Swamp Brook	2	Wetland equalizer in rural area.	YES	stream order and 4-foot wide channel
16.73	CV-ST 16.73	Raynham	Unnamed	1	Small, shallow perennial stream flowing east to west in rural area.	NO	shallow wetland equalizer
17.37	CV-ST 17.37	Raynham	Pine Swamp Brook No. 1	1	Perennial stream flowing west to east in rural area.	YES	defined stream channel/ present only within Pine Swamp.
17.96	CV-ST 17.96	Raynham	Pine Swamp Brook No. 2	1	Perennial stream flowing west to east in rural area.	YES	defined stream channel/ present only within Pine Swamp.
19.50	Undergrade bridge for Taunton River BRIDGE T-01-071	Taunton	Taunton River	5	Perennial stream flowing east to west in urban area.	YES	stream order, horizontal and vertical clearance
19.70	Undergrade bridge for Taunton River BRIDGE T-01-072	Taunton	Taunton River	5	Perennial stream flowing west to east in urban area.	YES	stream order, horizontal and vertical clearance
19.80	Undergrade bridge for Taunton River BRIDGE T-01-073	Taunton	Taunton River	5	Perennial stream flowing west to east in urban area.	YES	stream order, horizontal and vertical clearance
20.00	Undergrade bridge for Mill River BRIDGE T-01-074	Taunton	Mill River	4	Perennial stream flowing west to east in urban area.	YES	stream order, horizontal and vertical clearance

Milepost	Identification	Town	Name of Waterbody	Stream Order	Description	Potentially Navigable	Rationale
New Bedford Main Line							
11.80	Undergrade bridge for Taunton River	Taunton	Taunton River	5	Perennial stream flowing east to west in urban area.	YES	stream order, horizontal and vertical clearance
TBD	No designation	Taunton	Unnamed tributary to the Taunton River	1	Wetland equalizer in suburban/rural area.	NO	no defined channel upstream or downstream
14.52	CV-NB 14.52	Taunton/ Berkley	Unnamed tributary to Cotley River	1	Perennial stream flowing west to east in a suburban area.	YES	open channel downstream
15.17	Undergrade bridge for Cotley River BRIDGE B-08-004	Berkley	Cotley River	2	Perennial stream flowing west to east in rural area.	YES	stream order, horizontal and vertical clearance
15.70	Undergrade bridge for Cotley River BRIDGE B-08-005	Berkley	Cotley River	2	Perennial stream flowing east to west in rural area.	YES	stream order, horizontal and vertical clearance
17.33	CV-NB 17.33	Berkley	Unnamed tributary to Cedar Swamp River	1	Perennial stream flowing east to west in rural area.	NO	stream order, horizontal and vertical clearance
17.99	CV-NB 17.89	Lakeville	Unnamed tributary to Cedar Swamp River	2	Perennial stream flowing east to west in rural area.	YES	stream order, horizontal and vertical clearance
18.60	Undergrade bridge for Cedar Swamp (Assonet River) No. 1 BRIDGE L-01-018	Lakeville	Cedar Swamp River (Assonet River) No. 1	3	Perennial stream flowing east to west in rural area.	YES	stream order, horizontal and vertical clearance
21.65	Undergrade bridge for Fall Brook BRIDGE F-09-028	Freetown	Fall Brook	4	Perennial stream flowing west to east in rural area.	YES	stream order, horizontal and vertical clearance
20.89	CV-NB 20.89	Lakeville	Unnamed tributary to Fall Brook	1	Wetland equalizer in rural area.	NO	no defined channel
26.96	CV-NB 26.96	New Bedford	Unnamed	3	Wetland equalizer in urban/rural area.	YES	Stream stats (USGS does not show crossing.)

Milepost	Identification	Town	Name of Waterbody	Stream Order	Description	Potentially Navigable	Rationale
Fall River Secondary							
0.92	Undergrade bridge for Cedar Swamp (Assonet River) No. 2 BRIDGE L-*TBD*	Lakeville	Cedar Swamp River (Assonet River) No. 2	3	Perennial stream flowing east to west in rural area.	YES	stream order, horizontal and vertical clearance
1.47	CV-FR 1.47	Freetown	Unnamed tributary to the Cedar Swamp River	1	Perennial stream flowing east to west in rural area.	NO	no defined stream channel, densely vegetated
2.13	CV-FR 2.13	Freetown	Unnamed tributary to Forge Pond/Assonet River	1	Intermittent stream flowing east to west in rural area.	NO	dense vegetation, no defined channel
TBD	Number not assigned.	Freetown	Unnamed tributary to Fall Brook	2	Intermittent stream flowing west to east in rural area.	YES	stream order, size of existing culvert,
4.50	CV-FR 4.50	Freetown	Terry Brook Pond	0	Pond connector for bisected Terry Brook Pond in rural area.	Navigable but not jurisdictional	This structure connects two halves of non-jurisdictional Terry Pond.
	Undergrade bridge for Massachusetts Route 24 and Rattlesnake Brook	Freetown	Rattlesnake Brook	2		YES	This is a railroad bridge over Route 24 - Route 24 bridge crosses Rattlesnake Brook.
6.01	CV-FR 6.01	Freetown	Unnamed tributary to the Taunton River	2	Intermittent stream in rural area.	NO	pond outflow, poorly defined small channel
6.86	CV-FR 6.86	Fall River	Unnamed tributary to the Taunton River	1	Intermittent stream flowing east to west in rural area.	NO	poorly defined channel
52.38	Undergrade bridge for channel near Battleship Cove/ stone railroad tie bridge	Fall River	Stream Not Shown On USGS, StreamStats	1	Perennial stream flowing east to west in urban area.	NO	outlet for Watuppa Reservoir, no channel upstream
11.65	CV-FR 11.65	Fall River	Quequechan River	2	Perennial stream flowing east to west in urban area.	NO	collapsed culvert with no upstream channel

This mapping project was a collaborative effort between DEP and the Massachusetts Office of Coastal Zone Management intended to catalog and geo-reference historic maps, charts and surveys of the Massachusetts coast to identify the earliest known shoreline that existed prior to human alteration by placement of fill, damming or other means. The resulting historic high water mark is a combination of data identifying the most likely historic shoreline for the Commonwealth. While this data does not carry statutory or regulatory authority per se, in practice, DEP presumes the historic high water mark and limits of jurisdiction generated by this project represent the oldest most credible shoreline that existed prior to human alteration.

The location of filled tidelands, Massachusetts Coastal Zone and Designated Port Areas used in this chapter were provided by MassGIS, Massachusetts DEP and Massachusetts Office of Coastal Zone Management. The location of the presumed historic high water mark and South Coast Rail project elements in filled tidelands are shown on Figures 4.18.9 through 4.18.19.

4.18.3.4 Landlocked Tidelands, and Coastal Zone and Designated Port Areas Boundaries

Figures 4.18.11 through Figure 4.18.18 depict the Coastal Zone boundaries and the DPAs present within the study area. The limits of the DPAs listed in this chapter and the Coastal Zone boundaries were determined using preliminary GIS data provided by the Massachusetts Coastal Zone Management Program. Landlocked Tidelands are identified in Figures 4.18-11, 4.18-12 and 4.18-18.

4.18.4 Impacts by Element

This chapter provides a description of each project element and outlines the known and potential jurisdictional areas subject to Massachusetts Chapter 91 and the MCZP. The two Build Alternative alignments are shown in Figure 4.18-1 (Stoughton Alternative) and Figure 4.18-2 (Whittenton Alternative). (It should be noted that Section 9 of the Rivers and Harbors Appropriation Act of 1899 (33 U.S.C. 403; Chapter 425, March 3, 1899; 30 Stat. 1151) prohibits the construction of any bridge, dam, dike or causeway over or in navigable waterways of the United States without Congressional approval (see Chapter 8, *Regulatory Compliance*). Administration of Section 9 has been delegated to the Coast Guard. Structures authorized by State legislatures may be built if the affected navigable waters are totally within one State, provided that the plan is approved by the Chief of Engineers and the Secretary of Army (33 U.S.C. 401). Section 10 of the Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been approved by the Chief of Engineers.)

The Stoughton and Whittenton Alternatives each include an electric and a diesel variant (See Chapter 2). Both alternatives would involve development along the same alignment and include the same stations and layover sites. In addition to the development of the alignment, stations and layover facilities, the electric alternatives would involve development of traction power substations, and therefore would potentially affect more Coastal Zone and Chapter 91 resources than would the diesel alternatives. As such, this chapter is focused on evaluation of the Stoughton and Whittenton Electric Alternatives as the worst-case potential impact.

4.18.4.1 No-Build (Enhanced Bus) Alternative

The No-Build Alternative would consist of enhancing current bus service along existing roads and highways. Three existing Park and Ride facilities would be modified as part of the No-Build Alternative:

- West Bridgewater Park and Ride, located near the southwest corner of the intersection of Routes 106 and 24;
- Mount Pleasant Street Park and Ride, located on the northwest corner of the intersection of King's Highway and Route 140 in New Bedford;
- Galleria Park and Ride, located adjacent to the Silver City Galleria shopping mall in Taunton.

None of the elements proposed under the No-Build Alternative are located within Chapter 91 or Coastal Zone jurisdiction. Therefore, no impacts would occur.

4.18.4.2 Southern Triangle Study Area (Common to all Build Alternatives)

The Build Alternatives use existing segments of the railroad right-of-way along the New Bedford Main Line and Fall River Secondary (together referred to as the Southern Triangle). This section describes the portions of these rail lines that are located within the coastal zone, and the portions subject to regulation under Chapter 91. The northern elements of the Build Alternatives within the coastal zone are described in subsequent sections, as are the proposed station sites and layover facilities. These resources are relative to the tidal portions of the Taunton and Acushnet Rivers, generally limited to the adjacent waters of New Bedford Inner Harbor and Mount Hope Bay.

Fall River Secondary

The existing Fall River Secondary freight track extends from Myricks Junction in Berkley to Battleship Cove in Fall River (Figure 4.18-1 and 4.18-2). The corridor crosses several areas of filled tidelands in Fall River, several non-tidal rivers and streams potentially subject to Chapter 91 and portions of the Massachusetts Coastal Zone in Freetown and Fall River.

Work includes reconstructing existing track, addition of a second track, ballast and culvert and bridge replacement. The electric alternative includes constructing an overhead catenary system to provide motive power that would be installed within the railroad right-of-way. Stations and Layovers for the Fall River Secondary are discussed in the Stations and Layover Facilities sections.

Chapter 91 Areas

The Fall River Secondary crosses approximately 4,100 feet of filled tidelands in seven locations (see Figures 4.18-14 through 4.18-19 and Table 4.18-3). Research performed in consultation with the DEP Waterways Program staff was unable to locate licenses for several locations where the track crosses filled tidelands. Because these tidelands were filled and the track was originally constructed in the 1850s, remaining in continuous use since that time, their continued use and permitted maintenance or minor modifications may be authorized under 310 CMR 9.05 provided no unauthorized structural alteration has occurred since January 1, 1984.

The Build Alternatives do not include any work within Fall River Harbor or the tidal portions of the Taunton River. The Fall River Secondary includes three non-tidal river crossings potentially subject to Chapter 91 Jurisdiction. This crossing (see Figure 4.18-14) is consistent with Chapter 91 jurisdiction because the river is navigable during certain times of year by a small boat such as a canoe or kayak. Table 4.18-4 lists the crossing and provides a summary of the jurisdictional status and rationale for the determination.

Table 4.18-3 Project Elements in Filled Tidelands: Fall River Secondary

Location ID[1]	Length (ft)	Municipality	Authorization
FR 1	840	Fall River	License not available; continued use, maintenance and minor modifications may be permitted pursuant to 310 CMR 9.05 and 310 CMR 9.22.
FR 2	1270	Fall River	
FR 3	50	Fall River	
FR 4	370	Fall River	
FR 5	160	Fall River	
FR 6	900	Fall River	
FR 7	530	Fall River	

1 See Figures 4.18-15 and 4.18-19.

Table 4.18-4 Non-Tidal River and Stream Crossings–Fall River Secondary

Waterbody	Municipality	Potentially Jurisdictional	Rationale	Presently Licensed	Anticipated Ch. 91 approval
Assonet River (Cedar Swamp River)	Lakeville	Yes	Navigable river/stream	No	New License

Coastal Zone Areas

Approximately 6.6 miles of the Fall River Secondary (in three segments) is located within the Coastal Zone (see Figures 4.18-14 through 4.18-19). A total of 0.5 mile of the Fall River Secondary near the southern end of the project area is located within the Mt. Hope Bay Designated Port Area, consisting of approximately 2,100 feet near Weaver's Cove (Figure 4.18-16) and 500 feet near Battleship Cove (Figure 4.18-18). The continued use and anticipated replacement/upgrade or enhancement of track within the Coastal Zone and DPAs is consistent with the regulatory policies of the Massachusetts Coastal Zone Management Plan. These improvements would maintain or enhance the capacity of the affected coastal zone and DPA to support marine based industry. A more detailed review of the project's compliance with the regulatory policies of the MCZMP is provided in section 4.18.6.

New Bedford Main Line

The existing New Bedford Main Line freight track extends from Weir Junction in Taunton to the State Pier in New Bedford (see Figures 4.18-1 and 4.18-2. The corridor crosses several areas of filled tidelands south of Wamsutta Street in New Bedford and eight Chapter 91 jurisdictional non-tidal rivers and streams.

Work includes reconstructing existing track, addition of a second track, ballast and culvert and bridge replacement. Electric alternatives include an overhead catenary system to provide motive power that would be installed within the railroad right-of-way. Stations and Layovers for the New Bedford Main Line are discussed in later sections.

Chapter 91 Areas

The New Bedford Main Line crosses approximately 4,300 feet of filled tidelands in four locations, all located south of Wamsutta Street in New Bedford (see Figure 4.18-13 and Table 4.18-5). These jurisdictional areas include existing track and a portion of proposed Whale's Tooth Station.

The construction of the New Bedford Main Line south of Wamsutta Street in New Bedford was originally authorized by Waterways License 166, issued on June 18, 1873 subsequent to Chapter 20 of the Acts of 1873. Review of DEP licensing records identified this license as authorizing the existing track from the Acushnet Street crossing to the terminus adjacent to Leonard's Wharf.

Table 4.18-5 Project Elements in Filled Tidelands–New Bedford Main Line

Location ID[1]	Length (ft)	Municipality	Authorization
NB 1	790	New Bedford	License 166, June 18, 1873
NB 2	1,740	New Bedford	License 166, June 18, 1873
NB 3	1,370	New Bedford	License 166, June 18, 1873
NB 4	400	New Bedford	License 166, June 18, 1873

1 See Figure 4.18-13.

The New Bedford Main Line also crosses eight non-tidal rivers and streams that are likely subject to Chapter 91 jurisdiction. These eight rivers are listed in Table 4.18-6. Of these eight crossings, a license has been identified for only the Taunton River, although it is possible that the existing track was authorized by the Massachusetts legislature as part of any of several approvals for the original construction of the track now collectively called the New Bedford Main Line.

The Waterways Regulations do not require a new license or license amendment for the continued use, maintenance or minor modifications to existing authorized fill or structures within jurisdictional areas, provided that the proposed work does not include a substantial enlargement of the existing structures or fill and the structures have been in existence since January 1, 1984.

The following sections describe the proposed work at the eight crossing and provide a summary of the potential approvals necessary under Chapter 91 and the Coastal Zone Management Program.

Taunton River—The Taunton River is a major regional river, is navigable at this crossing and is presumed to have had public funds expended for stream clearance, channel improvement and flood control. Accordingly, the river is subject to Chapter 91 jurisdiction.

The proposed work at this Taunton River Crossing (Figure 4.18-7, Tile 2) includes replacing the existing wooden pile supported trestle conveying a single track to single span concrete structure supporting two tracks. The work would remove the existing wooden piles and increase the width of the structure within areas of Chapter 91 jurisdiction. The proposed work would improve navigation by removing the existing piles supporting the four spans, but is also anticipated to reduce the space available for navigation by reducing the clearance by approximately 7.5 inches. These changes combined would likely require a new waterways license under Chapter 91.

Unnamed Tributary–Cotley River—The culvert designated CV-NB 14.52 (see Figure 4.18-8) conveys an unnamed tributary to the Cotley River beneath the right-of-way. This crossing would be replaced with a larger structure and would require a new license because (1) the replacement structure would exceed the footprint of the existing structure to accommodate a second set of tracks and (2) the right-of-way at this location does not constitute an existing public service project stipulated by 310 CMR 10.05(3)(c).

Proposed Bridge and Culvert Replacement Subject to Chapter 91

Table 4.18-6 Non-Tidal River and Stream Crossings–New Bedford Main Line

Milepost	Waterbody	Presently Licensed	Proposed Alteration	Number of Tracks Existing	Number of Tracks Future	Anticipated Chapter 91 Application
New Bedford Main Line						
11.80	Taunton River (Bridge T-01-075)	Yes	Bridge replacement: existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center span. New abutments would be constructed behind existing abutments which would then be removed.	1	2	New License
14.52	Unnamed tributary to Cotley River (CV-NB 14.52)	No	Replacement/expansion of existing culvert.	1	2	New License
15.17	Cotley River (Bridge B-08-004)	No	Bridge replacement: New abutments would be constructed behind the existing abutments, which would then be removed.	1	2	New License
15.70	Cotley River (Bridge B-08-005)	No	Bridge replacement: New abutments would be constructed behind the existing abutments, which would then be removed.	1	2	New License
17.89	Unnamed tributary to Assonet River [Cedar Swamp River] (CV-NB 17.89)	No	Replacement of existing culvert, not presently designed.	1	1	Maintenance
18.60	Assonet River (Cedar Swamp)No. 1 (Bridge L-01-018)	No	Bridge replacement: existing piles to be replaced by one mid-stream concrete pier. New abutments to be constructed outside existing structure which would then be removed.	1	1	New License
21.65	Fall Brook (Bridge F-09-028)	No	Bridge replacement: new abutments would be constructed behind existing abutments, which would then be removed.	1	1	Minor modification
26.96	Unnamed (CV-NB 26.96)	No	Replacement of existing culvert, not presently designed.	1	1	Maintenance

Cotley River (1)—This Cotley River crossing (Figure 4.18-8, Tile 1) is subject to Chapter 91 jurisdiction because it is navigable during at least part of the year. The proposed work would require a new Chapter 91 license because the project includes widening the crossing from one track to two. This substantial enlargement does not typically meet the regulatory criteria for maintenance or minor modifications permitted under 310 CMR 9.22.

Cotley River (2)—This Cotley River crossing (Figure 4.18-8, Tile 2) is subject to Chapter 91 jurisdiction because it is navigable during at least part of the year. The proposed work would require a new Chapter 91 license because the project includes widening the crossing from one track to two. This substantial enlargement does not typically meet the regulatory criteria for maintenance or minor modifications permitted under 310 CMR 9.22.

Cedar Swamp River—The Cedar Swamp River crossing (Figure 4.18-9, Tile 1) is subject to Chapter 91 jurisdiction because it is navigable during at least part of the year. The proposed work would require a new Chapter 91 license because the project includes widening the crossing from one track to two and the anticipated reduction of space available for navigation by reducing of clearance beneath the bridge by an estimated 6.75 inches. This substantial enlargement does not typically meet the regulatory criteria for maintenance or minor modifications permitted under 310 CMR 9.22 and a new license would be required.

Freetown Brook—Freetown Brook, also known as Fall Brook (Figure 4.18-9, Tile 2), is jurisdictional because its approximately 50-foot cross-section would appear to make it navigable at least part of the year. The proposed work would require a new license because the project includes modifications at this location.

Unnamed Tributary to Assonet River—The culvert designated CV-NB 17.89 (see Figure 4.18-8) conveys non-tidal rivers and streams presumed to be subject to Chapter 91 jurisdiction. This culvert is planned to be replaced by similarly sized structures, presumed to meet the regulatory criteria for maintenance authorized by 310 CMR 9.22(1).

Unnamed Watercourse in Acushnet Cedar Swamp—The culvert designated CV-NB 26.96 (see Figure 4.18-10) conveys non-tidal rivers and streams presumed to be subject to Chapter 91 jurisdiction. This culvert is planned to be replaced by similarly sized structures, presumed to meet the regulatory criteria for maintenance authorized by 310 CMR 9.22(1).

Coastal Zone Areas

Approximately 1,600 feet of the project is within the Coastal Zone associated with the Acushnet River and New Bedford Harbor. This jurisdictional area is all south of Wamsutta Street where the track crosses over the John F. Kennedy Highway (Route 18) and Acushnet Avenue.

Approximately 500 feet of the project near the southern end of the New Bedford Main Line is located within the New Bedford/Fairhaven DPA. The DPA boundary is approximately 70 feet east of the proposed Whale's Tooth Station. The location and extent of this DPA is shown on Figures 4.18-11 and 4.18-12. Work proposed within the DPA is limited to reconstruct the "tail track" south of the station, which would allow trains to access Whale's Tooth Station. These activities are consistent with the regulatory policies of the Massachusetts Coastal Zone Management Plan because they maintain or support the future use of this rail corridor as an accessory use to existing and potential water-dependent marine industrial uses within the DPA. A more detailed review of the project's compliance with the

Massachusetts Coastal Zone Management Plan is presented in Section 4.18.6. Work within the Massachusetts Coastal Zone, including this DPA, will require a Federal Consistency Certification by the Massachusetts Coastal Zone Management Program.

Northeast Corridor

The existing Northeast Corridor would be used for the Build Alternatives from Boston's South Station to Canton Junction. The existing double-track line supports both electric- and diesel-powered regional freight and passenger service. The Build Alternatives would use existing infrastructure between South Station and Canton Junction, and as such, would not involve new construction.

Stoughton Electric Alternative

Chapter 91 Areas

The Stoughton Electric Alternative uses existing rail corridors that were previously developed connecting the Northeast Corridor with the New Bedford Main Line. The existing right-of-way extends from Canton Junction in Canton to Weir Junction in Taunton (see Figures 4.18-1 and 4.18-2). The track from Canton Junction to Stoughton Station is presently an active passenger rail corridor. South of Stoughton Station, the railroad right-of-way remains largely intact; however, most of the track and ballast have been removed and the condition of the culverts and bridges varies. Work proposed within this corridor includes new track, ballast, culvert and bridge replacement, and in the case of electric alternative, an electric centenary system within the right-of-way to provide electric motive power.

The South Coast Rail project elements subject to licensing and therefore required to comply with 310 CMR 9.37(2) include certain non-tidal river and stream crossings. The majority of the non-tidal river and stream crossings is not adjacent to the shoreline and would not be expected to be subject to inundation due to a sea level rise of up to the 16 inches predicted by 2050. There are 13 crossings of non-tidal rivers that are subject to Chapter 91. See Table 4.18-7 for a listing of these crossings. The following section describes the work proposed at Forge Pond, Taunton River and Mill River crossings and summarizes the Chapter 91 jurisdiction.

Kingsley Pond/Forge Pond—The existing ballasted stone arch bridge spanning this hydraulic connection between Kingsley and Forge Ponds (Figure 4.18-3) would be replaced by a single span concrete structure supporting two tracks. While the alternatives using the Stoughton Line would require a second set of tracks, the proposed work is not anticipated to substantially expand the footprint of the structure. The proposed design is expected to be completed without the placement of any new fill within the waterway and without substantially reducing the space available for navigation. If these criteria can be met within the footprint of the existing structure, the work could be approved as maintenance or a minor project modification under the regulations at 310 CMR 9.22.

Beaver Meadow Brook—The Beaver Meadow Brook (Figure 4.18-3) crossing was designed to accommodate two tracks but presently contains only a single track supported by an historic arch bridge. The project includes the construction of a new span over the waterway supported by the existing abutments. A new license would be required because the work would constitute a substantial structural alteration defined at 310 CMR 9.02. While the crossing has not yet been designed, the additional span over the Beaver Meadow Brook would approximately double the footprint of structure over this waterbody.

Table 4.18-7 Proposed Bridge and Culvert Replacement Subject to Chapter 91–Stoughton Line

Milepost	Waterbody	Presently Licensed	Proposed Alteration	Number of Tracks Existing	Number of Tracks Future	Anticipated Chapter 91 Application
Stoughton Line						
0.87	Pequit Brook [Forge Pond]	No	No change to historic arch structure. Addition of second track, expansion of footprint over waterway, no change in navigability.	1	2	New License
1.64	Beaver Meadow Brook	No	No change to abutment location. New structure proposed above or adjacent to existing historic arch.	1	2	New License
6.80	Cowessett Brook [Whitman Brook]	No	New abutments would be constructed behind existing abutments, which would then be removed.	1	1	Maintenance
10.95	Black Brook (CV-ST 10.95)	No	Replacement of existing culvert, not presently designed.	1	1	Maintenance
11.59	Unnamed tributary to Black Brook (CV-ST 11.59)	No	Replacement of existing culvert, not presently designed.	1	1	Maintenance
12.68	Black Brook (CV-ST 12.68)	No	New bridge would be constructed to replace washed out culvert.	1	1	New License (if deemed navigable)
16.00	Unnamed tributary to Pine Swamp Brook (CV-ST 16.00)	No	Replacement of existing culvert, not presently designed.	1	1	Maintenance
17.37	Pine Swamp Brook #1 (CV-ST 17.37)	No	Replacement of existing culvert, not presently designed.	1	1	Maintenance
17.96	Pine Swamp Brook #1 (CV-ST 17.96)	No	Replacement of existing culvert, not presently designed.			
19.50	Taunton River (Bridge T-01-071)	Lic. 3118 / Oct. 19, 1906	Reconstruction of existing crossing outside existing structure, removal of existing abutments.	1	1	New License or License Amendment
19.70	Taunton River (Bridge T-01-072)	Lic. 3118 / Oct. 19, 1906	Existing piles to be replaced by one mid-stream concrete pier. New abutments to be constructed outside existing structure which would then be removed.	1	1	New License or License Amendment
19.80	Taunton River (Bridge T-01-073)	Lic. 2909 / Nov. 1, 1904	Existing piles to be replaced by one mid-stream concrete pier. New abutments to be constructed outside existing structure which would then be removed.	1	1	New License or License Amendment

Milepost	Waterbody	Presently Licensed	Proposed Alteration	Number of Tracks Existing	Number of Tracks Future	Anticipated Chapter 91 Application
20.00	Mill River (Bridge T-01-074)	Lic. 3118 / Oct. 19, 1906	Reconstruction of existing crossing outside existing structure, removal of existing abutments.	1	1	New License or License Amendment

Taunton River—The Taunton River (Figure 4.18-7) is subject to Chapter 91 because it is navigable and presumably public funds have been expended for flood control either upstream or downstream of the existing rail crossings. The Stoughton line crosses the Taunton River at three locations between Dean Street and Weir Junction. Each of these existing crossings contains a single track on pile-supported steel and timber structures. These bridges include a recently installed private water supply pipe maintained by Aquaria Water, Inc. to supply water to a desalination plant.

The proposed replacement bridges would each support a single track on two-span bridges within the approximate footprint of existing structures and would include a replacement water supply line for the Aquaria desalination plant. The proposed construction at each of these crossings is anticipated to result in a net improvement to navigation because the work would include demolishing and removing timber piles supporting the existing structures. The proposed Taunton River bridges would reduce the vertical clearance between the Taunton River and the underside of the structure. The proposed work could be approved, at DEP discretion, as maintenance or a minor project modification provided the final design is determined by DEP to result in a net improvement to navigation. It is anticipated that these three bridges would require a new license or amendment of the existing license.

Mill River—The Mill River (Figure 4.18-7, Tile 1) is jurisdictional because it is navigable by small boat during at least part of the year. Its path through developed areas of Taunton makes it very likely that public funds have been expended for flood control, triggering Chapter 91 jurisdiction. The existing Mill River crossing is a single span open steel and timber bridge conveying a single track. The proposed replacement bridge would upgrade this crossing, but retain a single track. The preliminary design includes removing existing bridge and abutments resulting in an effective widening of approximately 25 feet, a substantial increase in the space available for wildlife movement, and potentially navigation. Preliminary design shows a small decrease in the clearance beneath the bridge. It is anticipated that the new bridge would require a new license or amendment of the existing license.

Additional Bridge and Culvert Replacements—The Stoughton Line improvements would include the replacement of six culverts and a Bridge over the Cowessett Brook. With the possible exception of the culvert designated CV-ST 11.59, these structures are anticipated to be replaced within the footprint of the existing fill and structures without any substantial structural alteration or substantial change in use as defined in the regulations. Accordingly, these improvements are anticipated to be approved by MassDEP as maintenance activities authorized pursuant to 310 CMR 9.22. The culvert at milepost 11.59 was washed out several years ago and would be replaced by a new bridge over Black Brook. If this section of Black Brook is deemed navigable by MassDEP, this bridge would require a new license.

Coastal Zone Areas

The Stoughton Line is entirely within inland communities and does not include any work within filled tidelands, flowed tidelands or the Massachusetts Coastal Zone.

Whittenton Electric Alternative

In addition to the segments it shares with the Stoughton Electric Alternative, the Whittenton Electric Alternative utilizes an abandoned rail corridor known as the Whittenton Branch to connect the Stoughton Line and the Attleboro Secondary north of Weir Junction in order to avoid Pine Swamp. The Whittenton Branch corridor runs from Raynham Junction in Raynham to Whittenton Junction in Taunton. The Whittenton Branch is a previously developed right-of-way that is no longer in rail service.

The track has been removed from the corridor, but much of the ballast and the bridge over the Mill River remain largely intact.

Chapter 91 Areas

Proposed work includes track construction and ballast and bridge replacement over the Mill River in Taunton. The Mill River in this area is a non-tidal river or stream navigable by canoe and kayak for at least part of the year, and therefore subject to Chapter 91 jurisdiction. There is not presently a license for this crossing.

The existing crossing consists of a four-span concrete pile-supported bridge with stone abutments. The preliminary design for the replacement bridge would provide a two-span structure with one concrete pile, which would result in a reduction in surface area covered by the existing bridge piles, and would result in greater river bottom surface area and bank area. The bridge over the Mill River would be reconstructed with fewer in-water piers than the current bridge, which would enhance navigability. The work is presumed to include removing the existing structures within the river and only a nominal change in the clearance beneath the bridge. This work could be approved as maintenance necessary to restore the serviceability of the existing public transportation structure under 310 CMR 9.22(1) because the work does not include adding a second track.

Coastal Zone Areas

The Whittenton Branch and Attleboro Secondary do not include any work within filled tidelands, flowed tidelands, or within the Massachusetts Coastal Zone.

Stations

Four of the proposed station sites are located on filled tidelands or are within the Massachusetts Coastal Zone: Battleship Cove (Figure 4.18-19 and 4.18-20), Fall River Depot (Figure 4.18-19 and 4.18-21), Freetown (Figure 4.18-15 and 4.18-22), and Whale's Tooth (Figure 4.18-13 and 4.18-23). Table 4.18-8 lists each station and identifies the applicable jurisdiction. The figures show each of the stations within the context of the project and within Chapter 91 and CZM jurisdiction.

Table 4.18-8 Project Elements in Filled Tidelands or Coastal Zone–Station Sites

Station Site	Waterbody	Municipality	Jurisdictional
Battleship Cove	Mount Hope Bay	Fall River	Landlocked Tidelands Coastal Zone
Fall River Depot	Mount Hope Bay	Fall River	Coastal Zone (partial)
Freetown	Taunton River	Freetown	Coastal Zone (partial)
Whale's Tooth	New Bedford Harbor	New Bedford	Landlocked Tidelands Coastal Zone

The following sections describe the anticipated station work within jurisdictional areas and corresponding approvals required.

Battleship Cove Station Site

The Battleship Cove station (Figure 4.18-19 and 4.18-20) would be a new train station constructed along the Fall River Secondary that would serve all Build Alternatives. It would be located on Water Street in Fall River, near the southern terminus of the Fall River Secondary. A conceptual diagram of the station is provided in Figure 4.18-20. This approximately 2.2-acre site is a previously developed parcel within the

Ponta Delgada Plaza. The station would be a platform-only station that would operate during peak hours only. It would serve the downtown area of Fall River and the Battleship Cove tourist area. The station would be designed to encourage walk-in and drop-off/pick-up customers. There is no dedicated parking currently planned at this station.

The Battleship Cove station would be located partially on landlocked tidelands because the station site is located greater than 250 feet from the existing mean high water of the Taunton River and the site was separated by interconnected public ways on January 1, 1984. The construction of the Battleship Cove station would therefore not require a new waterways license.

The station would be located entirely within the coastal zone, while only a portion of the station would be located within the Mount Hope Bay Designated Port Area. The proposed station construction would require a Federal Consistency Certification under the Massachusetts Coastal Zone Management Program because it includes work within the Coastal Zone. The proposed Battleship Cove station is anticipated to be consistent with the regulatory policies.

Fall River Depot Station Site

Fall River Depot station would be a new train (Figure 4.18-19 and 4.18-21) station constructed along the Fall River Secondary for all Build Alternatives. It would be located near the intersection of North Davol Street and Pearce Street, approximately 1 mile north of downtown Fall River. A conceptual diagram of the station is provided in Figure 4.18-21. Part of this approximately 8-acre site was previously developed as an historic train station. The new station is envisioned to be a multi-modal transportation center with new mixed-use development and parking facilities. The station would serve walk-in, bike-in, and drive-in customers.

Fall River Depot station would not be located within filled tidelands and would not be subject to Chapter 91. At the Fall River Depot Station site, Davol Street is the first major transportation infrastructure adjacent to the coast. As a result, the first 100 feet of the site’s frontage on Davol Street are located within the coastal zone associated with the Taunton River. The majority of the station site is located landward of the coastal zone boundary.

The proposed station construction would require a Federal Consistency Certification under the Coastal Zone Management Program because it includes work within the Massachusetts Coastal Zone. The proposed station construction is anticipated to be consistent with the regulatory policies.

Freetown Station Site

Freetown station would be a new train (Figure 4.18-15) station constructed to serve the Fall River Secondary for all Build Alternatives. It would be located along South Main Street in Freetown, at a site currently occupied by a self-storage business. A conceptual diagram of the station is provided in Figure 4.18-22. The approximately 18-acre site is near the Fall River Executive Park and the River Front Park. The station would serve drive-in customers and customers shuttled between the station and these nearby industrial parks.

Freetown station would not be located within filled tidelands and therefore would not be subject to Chapter 91. At the Freetown station site, South Main Street is the first major transportation infrastructure adjacent to the coast. As a result, the first 100 feet of the site’s frontage are located

within the coastal zone associated with the Taunton River (the entrance driveway). The majority of the station site is located landward of the coastal zone boundary.

The proposed driveway station construction would require a Federal Consistency Certification under the Coastal Zone Management Program because it includes work within the Massachusetts Coastal Zone. The proposed station construction is anticipated to be consistent with the regulatory policies.

Whale's Tooth Station Site

Whale's Tooth station would be a new train (Figure 4.18-13) station constructed in New Bedford along the New Bedford Main line and would serve all Build Alternatives. It would be located near the intersection of Acushnet Avenue and Hillman Street, near the southern terminus of the New Bedford Main line. A conceptual diagram of the station is provided in Figure 4.18-23. The City of New Bedford has constructed a parking lot on the approximately 14-acre site in anticipation of the South Coast Rail project. The station would include intermodal connections, potentially linking to ferry services. The station would serve walk-in, bike-in and drive-in customers.

The majority of the Whale's Tooth station would be located on landlocked filled tidelands because the station site was entirely separated from the existing mean high water mark of New Bedford Harbor by interconnected public ways on January 1, 1984, and is at least 250 feet landward of the existing mean high water mark. Accordingly, the station would not require a Waterways license. However, the station would require a Public Benefit Determination (see Section 4.18.5).

The station would be located entirely within the Coastal Zone associated with New Bedford Inner Harbor, but outside the New Bedford/Fairhaven DPA. The proposed station construction would require a Federal Consistency Certification under the Coastal Zone Management Program because it includes work within the Massachusetts Coastal Zone. The proposed station construction is anticipated to be consistent with the regulatory policies.

Layover Facilities

Two layover facilities are planned for the Southern Triangle: one near the southern end of the Fall River Secondary and another near the southern end of the New Bedford Main Line. The two proposed sites, listed below in Table 4.18-9, require evaluation for compliance with Chapter 91 and Coastal Zone management requirements. Coastal zone consistency and impacts to filled tidelands are described below for the Wamsutta, Weaver's Cove East layover sites, as applicable.

Table 4.18-9 Project Elements in Filled Tidelands–Layover Sites

Facility Name	Waterbody	Municipality	Jurisdictional
Wamsutta	New Bedford Harbor	New Bedford	Landlocked Tidelands Coastal Zone
Weaver's Cove East	Taunton River	Fall River	Filled Tidelands Coastal Zone

The following sections describe the location, jurisdiction and proposed work required for these layover facilities.

Fall River –Weaver's Cove East Layover Facility Site

The Weaver's Cove East layover facility (Figure 4.18-16) would be constructed along the Fall River Secondary and would serve all Build Alternatives. It would be located off of Main Street between the

existing Fall River Secondary freight line and the Taunton River, approximately 2.5 miles from the southern terminus of the Fall River Secondary. The Weaver's Cove East Layover Facility is subject to licensing and therefore required to comply with 310 CMR 9.37(2). It would be located approximately 20 feet above the current shoreline and would not be expected to experience inundation even under the highest predicted sea level rise of 6.6 feet by 2100.

Consultation with DEP Waterways' staff indicated that the Department considers that the Weaver's Cove East layover facility to be located within filled tidelands. The jurisdictional boundary is based on the shoreline shown on two historic maps provided by the DEP prepared in 1865 and 1874 (Figure 4.18-24 and 4.18-25). Both of these maps postdate the construction of the railroad. It is likely that the railroad impounded water in the vicinity of the proposed layover facility and this impoundment is represented on these historic maps. As such, the construction of the proposed layover facility would require a new Chapter 91 license. The Waterways Regulations are designed to protect and promote the public's interest in tidelands through the inclusion of provisions to conserve the capacity for water-dependent uses. The use of the site for layover needs is classified by DEP as a nonwater-dependent Infrastructure Facility (310 CMR 9.55). This classification may waive some of the above-referenced provisions, as long as feasible mitigation or compensation measures are provided such as the protection of maritime commerce or recreation and associated public access, reduction of flood and erosion-related hazards on lands subject to the 100-year flood or projected sea level rise, and the attainment of water quality goals.

The layover facility would be located entirely within the coastal zone associated with the Taunton River but outside the Mount Hope Bay DPA. Accordingly, the proposed layover facility would require a Federal Consistency Certification under the MCZMP. The proposed facility is anticipated to be consistent with the regulatory policies of the MCZMP.

New Bedford –Wamsutta Layover Facility Site

The Wamsutta layover facility (Figure 4.18-12) would be constructed along the New Bedford Main Line and would serve all Build Alternatives. It would be located near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main line. This location is just north of the Whale's Tooth Station site described above. The site is currently an active CSX rail yard used for freight. The existing and proposed rail yard is located on top of a capped hazardous waste facility.

The proposed Wamsutta layover facility would be located in landlocked tidelands and would be exempt from licensing under 310 CMR 9.04(2). The construction of the Wamsutta layover facility would require a Public Benefit Determination under 301 CMR 13.00.

The layover facility would be located entirely within the coastal zone associated with New Bedford Inner Harbor but is not within the new Bedford/Fairhaven DPA. The construction would require a Federal Consistency Certification under the Massachusetts Coastal Zone Management Program. The proposed facility is anticipated to be consistent with the regulatory policies of the MCZMP.

4.18.5 Public Benefit Determination

Portions of the South Coast Rail project are subject to the requirements of Chapter 168 of the Acts of 2007 because they are located on landlocked filled tidelands. The identification of landlocked tidelands is described above and is based on cartographic data published by MassGIS on behalf of DEP and OCZM.

The South Coast Rail project exceeds EIR review thresholds as defined in 301 CMR 11.03 and requires a Public Benefit Determination in accordance with the regulations at 301 CMR 13.00.[1] The Act requires projects subject to MEPA to consider a project's potential impacts on groundwater and in cases where projects are located in areas of known low groundwater include measures to avoid, minimize or mitigate potential impacts.

When making a Public Benefit Determination, the Secretary is required to consider the:

- Purpose and effect of the development;
- Impact on abutters and the surrounding community;
- Enhancement of the property;
- Benefits to the public trust rights in tidelands or other associated rights;
- Community activities on the development site;
- Environmental protection and preservation;
- Public health and safety;
- General welfare; and
- Protection of Groundwater.

The Secretary is also instructed by 301 CMR 13.00 to consider the differences between tidelands, landlocked tidelands, and great ponds when assessing the public benefit and shall consider the practical impact of the public benefit on development.

The South Coast Rail project elements that are located on filled tidelands, located at least 250 feet landward of existing flowed tidelands, and completely separated from flowed tidelands by one or more intervening roads are:

- Battleship Cove Station, Fall River;
- Whale's Tooth Station, New Bedford; and
- Wamsutta Layover Facility, New Bedford.

The following sections describe how each of the these stations and the layover facility provide appropriate public benefits and are adequately protective of the public's inherent rights in present and former waterways, held in trust by the Commonwealth for the benefit of the public.

MassDOT's purpose for the South Coast Rail project is "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, and to enhance regional mobility, while supporting smart growth planning and development strategies in affected communities."

[1] The public benefit determination discussed in this section is a state requirement unrelated to the U.S. Army Corps of Engineers public interest review as part of Clean Water Act Section 404 permitting.

Battleship Cove Station

The Battleship Cove Station (Figure 4.18-19 and 4.18-20) would be a new station constructed at the southern terminus of the Fall River Secondary, on Water Street in Fall River. This site is adjacent to the previously developed Ponta Delgada Plaza. The station would be a platform-only station that would operate during peak hours. It would serve downtown Fall River and the Battleship Cove tourist area. The station would be designed to encourage walk-in and drop-off/pick-up customers. Dedicated parking is not planned for this station.

The Battleship Cove Station site is approximately 825 feet from the nearest flowed tidelands of the Taunton River. A portion of the site is located on filled tidelands entirely separated from the flowed tidelands by Water Street.

MassDOT is currently developing plans for modified access ramps to Route 79 which would cross the proposed station. These ramps, if constructed, would change adjacent land uses and traffic patterns, and would change the visual environment in the vicinity of the station.

Purpose and Effect of the Development

The purpose of the Battleship Cove Station is to provide commuter rail access to the downtown and Battleship Cove areas of Fall River, providing new transportation access to the regional MBTA services. The station is intended to operate during peak morning and evening hours.

The effects of the development would be the creation of a new public transportation facility providing regional commuter rail service to downtown Fall River and the Battleship Cove area where none presently exists; and construction of approximately 10,000 square feet of platform within an area of filled tidelands.

Impact on Abutters and Community

The Battleship Cove Station is expected to result in a net benefit to abutting properties and the Fall River community. Potential adverse impacts to abutters are expected to be minimal because the adjacent private uses are light commercial/ industrial and warehousing. The proposed station is not expected to interfere with these uses and would result in small net benefit by revitalizing the existing rail infrastructure adjacent to the site.

Potential impacts to the community are expected to be beneficial, resulting from a new transportation link to the regional MBTA system. There would be no impact on the existing park.

Enhancement of the Property

The proposed Battleship Cove Station would enhance the site by rehabilitating the existing rail infrastructure along this section of the Fall River Secondary and activating the property for public transportation use.

Benefits to the Public Trust Rights in Tidelands or Other Associated Rights

The Battleship Cove Station would provide net benefit to the public trust rights in filled tidelands at the site by providing new public access and public transportation uses to the Fall River Secondary and adjacent land. The traditional public trust rights to tidelands include fishing, fowling, and navigation.

While these activities are not possible on the site due to its location approximately 825 feet from the nearest flowed tidelands, the logical extension of such rights in filled tidelands protected by Chapter 91 include the public's rights to pedestrian access and other lawful purposes.

The proposed station and associated public transportation uses would meet these goals. While much of the site contains an open grassy landscaped area adjacent to the Ponta Delgada Monument and plaza and is open to the public, access would not be affected by the station.

Community Activities on the Site

The Battleship Cove Station would increase community activities at the site by providing new access to the regional rail transportation network. The MBTA estimates that approximately 240 daily passengers would use the station.

Environmental Protection/Preservation

The Battleship Cove Station construction would meet all local, state and federal environmental protection requirements and comply with all applicable regulations, as identified in the extensive public review process.

Public Health and Safety

The South Coast Rail project would promote public health and safety through a site design that provides a safe and universally accessible facility for public use. Providing passenger rail service to the Battleship Cove Station and adjacent downtown Fall River area would result in net benefits to public health and safety resulting from a reduction in single passenger vehicle trips, air pollution and regional traffic.

General Welfare

The Battleship Cove Station would promote the general welfare by providing area residents with new public access to the existing regional transportation system. MassDOT would use public funds to provide direct and tangible benefits to the residents and visitors to the Battleship Cove area. The station has been designed to promote use by local residents. The potential for traffic impacts has been mitigated by limiting the number of parking spaces at the station site to the required handicapped-accessible spaces only, and by promoting pick-up/drop-off and local bus connections.

Protection of Groundwater

The Battleship Cove Station site is not within an area of known low groundwater, and is not anticipated to have any adverse impacts to the existing groundwater conditions. The station would be a platform constructed essentially at-grade. No basement, extensive excavation, or groundwater cut-off wall are proposed during construction and no short- or long-term impacts to groundwater are anticipated.

Whale's Tooth Station

Whale's Tooth Station would be a new train station constructed in New Bedford (Figure 4.18-13 and 4.18-23). It would be located near the intersection of Acushnet Avenue and Hillman Street, near the southern terminus of the New Bedford Main Line. The City of New Bedford has constructed a parking lot on the approximately 14-acre site in anticipation of the South Coast Rail project. The station would

include intermodal connections, potentially linking to ferry services. The station would serve walk-in, bike-in and drive-in customers.

The majority of the Whale's Tooth Station would be located on landlocked filled tidelands because the station site is entirely separated from the mean high water mark of New Bedford Harbor by interconnected public ways and is at least 250 feet landward of the mean high water mark. The station would require a Public Benefit Determination, but not a Waterways license. The following sections describe the public benefits of the proposed Whale's Tooth Station.

Purpose and Effect of the Development

The purpose of the Whale's Tooth Station is to provide new passenger rail or bus access to the New Bedford downtown waterfront area, improving access to the MBTA and regional public transportation network. The station would be adjacent to an existing City of New Bedford parking lot and would be accessible to passengers walking, biking, or driving to the station.

The effects of the development would be the creation of a new public transportation facility providing commuter rail service to the downtown New Bedford area, and activation of filled tidelands for public use for construction of the proposed station and vehicle circulation areas.

Impact on Abutters and Community

The Whale's Tooth Station is expected to result in minimal adverse impacts to abutters and a net benefit to the New Bedford community. Adverse impacts to abutters are expected to be minimal because the adjacent properties consist primarily of Route 18 (a six-lane divided highway) and industrial/trucking properties to the west and south, vacant land and industrial properties to the east, and the Greater New Bedford Career Center to the north.

None of these existing uses are likely to be disrupted either by construction or operation of the proposed station. The Greater New Bedford Career Center users would benefit from improved access to the regional transportation network by providing their clientele with improved access to career opportunities along the proposed passenger rail corridor.

The New Bedford community at large would also benefit from the proposed station by gaining short-term construction related jobs and long-term improved access to the regional transportation network. No short-term adverse impacts to the community are expected.

Enhancement of the Property

The Whale's Tooth Station would enhance the property by providing new public transportation infrastructure adjacent to an existing paved parking lot.

Benefits to the Public Trust Rights in Tidelands or Other Associated Rights

The Whale's Tooth Station would provide a net benefit to the public trust rights in filled tidelands at the site by providing new access to the planned passenger rail network. The City of New Bedford has constructed a new parking lot on the site in anticipation of the project. The proposed station would enhance the public's use of the landlocked tidelands by increasing utilization of the site and providing access to additional regional transportation options.

Community Activities on the Site

The Whale's Tooth Station would increase community activities at the site by increasing utilization of the existing 14-acre paved parking facilities at the site.

Environmental Protection/Preservation

The Whale's Tooth Station construction would meet all local, state and federal environmental protection requirements and comply with all applicable regulations, as identified in the extensive public review process.

Public Health and Safety

The South Coast Rail project would promote public health and safety through a site design that provides a safe and universally accessible facility for public use. Providing passenger rail service to the site and the downtown New Bedford area would result in net benefits to public health and safety resulting from a reduction in single passenger vehicle trips, air pollution, and regional traffic.

General Welfare

The Whale's Tooth Station would promote the general welfare by providing area residents with new public access to the existing regional transportation system. MassDOT would use public funds to provide direct and tangible benefits to the residents and visitors to New Bedford. The station's proximity to Route 18, a six lane divided highway, and existing local bus services would take advantage of the existing road network reducing potential adverse transportation impacts that could result from the South Coast Rail project. The 14-acre surface parking lot constructed by the City of New Bedford at the site would minimize potential impacts to parking in the vicinity of the site.

Protection of Groundwater

The Whale's Tooth Station site is not within an area of known low groundwater, and would not be anticipated to have any adverse impacts to the existing groundwater conditions. The station would be a single platform constructed at grade. No basement, extensive excavation or groundwater cut-off walls are proposed during construction and no short- or long-term impacts to groundwater are anticipated.

Wamsutta Layover Facility

The Wamsutta Layover Facility (Figure 4.18-12 and 4.18-13) would be constructed along the New Bedford Main Line. It would be located near the intersection of Wamsutta Street and Herman Melville Boulevard, near the southern terminus of the New Bedford Main Line. This location is just north of the Whale's Tooth Station site described above. A portion of the site is currently an active CSX rail yard used for freight. The existing and proposed rail yard is located on top of a capped hazardous waste landfill.

The Wamsutta Layover Facility would be entirely within landlocked tidelands because the site is entirely separated from the water sheet of New Bedford Harbor by Herman Melville Boulevard (a public way in existence on January 1, 1984) and it is located at least 250 feet from the existing mean high water mark.

The following sections describe the public benefits resulting from the construction of that portion of the proposed Wamsutta Layover Facility within landlocked tidelands.

Purpose and Effect of the Development

The purpose of the Wamsutta Layover Facility is to provide an overnight storage site for equipment needed for the early morning trains departing New Bedford for Boston. In most cases, these trains would have completed one of the last southbound runs of the prior day. Making use of a terminal layover facility avoids the need to run empty equipment to Boston for overnight storage and then back to New Bedford for the first northbound train. This important operation detail would reduce fuel consumption, operation and maintenance costs, and potential environmental impacts to air quality and noise associated with extra late-night and early morning trains.

Potential impacts to the community are expected to be minimal because the proposed site is currently an active CSX freight rail yard located along the waterfront in an area dominated by commercial, industrial and warehouse properties.

Impact on Abutters and Community

The Wamsutta Layover Facility is expected to have minimal adverse impacts to abutters, a net benefit to the New Bedford community and a substantial benefit to abutters to the New Bedford Main Line. Adverse impacts to abutters are expected to be minimal because the site is currently used as an active freight rail yard and construction would be limited to:

- Reconstructing the existing rail infrastructure;
- Installing electric utilities to serve the facility and a drainage system designed to collect and treat stormwater runoff prior to discharge from the site;
- Constructing a small operations building with crew facilities and a small number of parking spaces to support train crews and operations staff.

The Wamsutta Layover Facility would result in a net benefit to each community adjacent to the New Bedford Main Line and the Stoughton Line because the facility would prevent the need to shuttle empty passenger trains north in the evening and south before the first scheduled northbound train, reducing the potential for air quality and noise impacts on these communities.

Enhancement of the Property

The proposed Wamsutta Layover Facility would marginally enhance the property by replacing one rail use with another.

Benefits to the Public Trust Rights in Tidelands or Other Associated Rights

The Wamsutta Layover Facility would improve the capacity of the site to protect the public trust rights in filled tidelands by converting a private freight rail yard to a public transportation facility. As a matter of public safety, the existing use precludes public access for any purpose. While the proposed facility would also prohibit public access to these filled tidelands, the change in use would benefit trust rights in these lands by providing a vital transportation infrastructure facility.

Community Activities on the Site

The Wamsutta Layover Facility is not expected to increase community activities at the site because all public access would continue to be prohibited as a matter of public safety.

Environmental Protection/Preservation

The Wamsutta Layover Facility construction and operation would meet all local, state and federal environmental protection requirements and comply with all applicable regulations, as identified in the extensive public review process.

Public Health and Safety

The South Coast Rail project would promote public health and safety through implementing a site design that provides a safe and universally accessible facility for operator use while restricting public access. The proposed facility would continue to serve as a cap for the soils containing oil and hazardous materials present at the site. The site would be fenced and lighted to further protect public health and safety. Additionally, siting an overnight layover facility at the New Bedford Main Line terminus would eliminate the need to shuttle empty trains north following the last run of the evening and back to New Bedford for the first morning commute, reducing the potential for air quality and noise impacts.

General Welfare

The Wamsutta Layover Facility would promote the general welfare by activating the filled tidelands at the site for a public purpose, reducing extra train trips which would otherwise be required, resulting in fewer potential environmental impacts and substantial saving in fuel and operations and maintenance costs for the life on the project.

Protection of Groundwater

The proposed Wamsutta Layover Facility is not within an area of known low groundwater, and is not expected to have any discernible impact on groundwater at the project site because the site is a capped hazardous materials site and is designed to prevent infiltration of surface runoff to groundwater.

Public Benefits Determination Summary

MassDOT's project purpose is "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, and to enhance regional mobility, while supporting smart growth planning and development strategies in affected communities." The project would have a substantial public benefit by improving transportation to the under-served South Coast communities.

The South Coast Rail project elements proposed within landlocked tidelands have been sited and preliminarily designed to protect the public interests in tidelands and result in public benefits as required by Chapter 168 of the Acts of 2007 and in accordance with the regulations at 301 CMR 13.00. The project would result in substantial net benefits to the public interest in filled tidelands by revitalizing and expanding public infrastructure in a manner which meets all applicable state and federal environmental protection standards while minimizing potential impacts to abutters to these stations and layover facility and the community.

4.18.6 Coastal Zone Management

The Massachusetts Coastal Zone Management Plan and regulations implement the federal Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451 et seq.). The Coastal Zone Management Act established federal statutory authority to the management of the nation's coastal resources balancing economic development with environmental conservation. The Massachusetts Coastal Zone Management Act (MGL Chapter 21A, Sections 2 and 4A) established local authority to implement the Massachusetts Coastal Zone Management Plan (CZMP) through regulations at 301 CMR 20.00 through 301 CMR 25.00. The following regulations are most pertinent to the South Coast Rail project:

- 301 CMR 21.00 requires a federal consistency certification issued by the Office of Coastal Zone Management for projects in the coastal zone deemed likely to affect the coastal zone and require a federal action.

- 301 CMR 23.00 establishes state procedures for the preparation of Municipal Harbor Plans. Approved plans provide municipalities a mechanism for modifying certain requirements of Chapter 91 Licensing.

- 301 CMR 25.00 establishes state authority to delineate Designated Port Areas within the coastal zone to protect the unique capacity of developed ports and port infrastructure to support water-dependent industrial activities.

These regulations, in concert with the Waterways Regulations (310 CMR 9.00), create a regulatory framework for planning, licensing and implementing projects in the Massachusetts Coastal Zone. The South Coast Rail project includes track, stations and layover facilities within the Massachusetts Coastal Zone and would require compliance with each of these regulations.

The Massachusetts Coastal Zone Management regulations at 310 CMR 21.98 establish twenty program policies and nine management principles that projects subject to federal consistency certification must comply with. The following sections provide a summary of each of the twenty-five program policies and three management principles established by 301 CMR 21.98 and describes how the project is consistent with each applicable policy or management principle.

The program’s twenty-eight policies and principles are divided into the following 9 categories:

- water quality;

- habitat;

- protected areas;

- coastal hazards;

- port and harbor infrastructure;

- public access;

- energy;

- ocean resources; and
- growth management.

This section lists each policy and management principle as contained in the regulations at 301 CMR 21.00 and demonstrates that the project can be designed and constructed consistent with them.

4.18.6.1 Water Quality

This section addresses the South Coast Rail project's compliance with water quality standards and identifies pollution prevention and low impact development (LID) measures at proposed station sites and layover facilities.

Compliance with state water quality standards and policies is a requirement for federal consistency under the CZMP and the regulations at 301 CMR 21.98. This regulation establishes the CZMP's programmatic policies and management principles which form the basis for federal consistency.

Water Quality Policy #1

Ensure that point-source discharges in or affecting the coastal zone are consistent with federally approved state effluent limitations and water quality standards.

Water Quality Policy #2

Ensure that nonpoint pollution controls promote the attainment of state surface water quality standards in the coastal zone.

Chapter 4.17, *Water Resources*, provides a comprehensive review of the project's compliance with applicable state and federal water quality standards regarding point-source, nonpoint-source, and subsurface discharges at proposed stations and layover facilities. The South Coast Rail project has been designed to meet these environmental protection requirements through compliance with all applicable federal and state regulations governing sources or air and water pollution and wetland protection.

The South Coast Rail project's compliance with the Wetlands Protection Act stormwater regulations are described in Chapter 4.17, *Water Resources*. Compliance with the NPDES Construction General Permit would be achieved through the preparation and filing of a NPDES Notice of Intent and a Stormwater Pollution Prevention Plan (SWPPP) for each station or layover facility site. Compliance with operational stormwater requirements would be achieved through the use of LID measures designed to control the volume, rate, and quality of stormwater runoff discharged from each station or layover facility. LID measures planned for the proposed stations and layover facilities are described in detail in Chapter 4.17, *Water Resources*. The design and construction of the project will be subject to numerous levels of local, state and federal review. This multi-layer permitting process will help ensure that the project is constructed and operated in accordance with these standards.

Water Quality Policy #3

Ensure that activities in or affecting the coastal zone conform to applicable state and federal requirements governing subsurface waste discharges.

Subsurface Waste Discharges

Layover facilities would have limited water use for sanitary facilities. Effluent from these uses would be discharged to municipal sanitary treatment facilities. The South Coast Rail project does not involve subsurface waste discharges.

Air Pollution

The South Coast Rail project would result in a net reduction in air pollution and a net benefit to regional air quality as described in detail in Chapter 4.9, *Air Quality*. The South Coast Rail project is not anticipated to require any new local, state, or federal permit related to air pollution.

Water Pollution

The South Coast Rail project would meet all applicable local, state, and federal requirements regarding potential water pollution and MassDOT would obtain all needed permits under these regulations as described in Chapter 4.17. No point source discharges are proposed. All storm water collected at stations and layover facilities would be treated in accordance with the Massachusetts Stormwater Regulations and, for layover facilities, in accordance with applicable NPDES discharge requirements.

Wetland Protection

The South Coast Rail project would protect state and federally regulated wetlands by adherence to all applicable regulations. The project has been designed to avoid, minimize, and mitigate wetland impacts to the greatest extent practicable and is anticipated to receive permits under the Massachusetts Wetlands Protection Act, Section 401 of the Clean Water Act (Water Quality Certificate) and Section 404 of the federal Clean Water Act. The project would require a Variance under the Wetlands Protection Act pursuant to 310 CMR 10.05(10) subject to approval by the MassDEP Commissioner. The Commissioner may waive certain regulations when mitigating measures are proposed that would allow the project to be conditioned so as to contribute to the public interests in wetlands.

Chapter 4.16, *Wetlands*, provides a complete description of the anticipated wetland impacts and proposed mitigation measures.

4.18.6.2 Habitat

Habitat Policy #1

Protect coastal resource areas including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and fresh water wetlands for their important role as natural habitats.

The proposed project would not alter any coastal resource area including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds or eelgrass beds. In addition, no impacts to freshwater wetlands are proposed within the Coastal Zone.

Habitat Policy #2

Restore degraded or former wetland resources in coastal areas and ensure that activities in coastal areas do not further wetland degradation but instead take advantage of opportunities to engage in wetland restoration.

The Build Alternatives would be designed to comply with this policy. A complete description of the alternatives' potential impacts to wetland resources is presented in Chapter 4.16, *Wetlands*.

4.18.6.3 Protected Areas

Protected Areas Policy #1

Preserve, restore, and enhance complexes of coastal resources of regional or statewide significance through the Areas of Critical Environmental Concern program.

None of the Build Alternatives include any work within a coastal ACEC nor would it affect natural coastal resources. ACECs are discussed in Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*.

Protected Areas Policy #2

Protect state and locally designated scenic rivers and state classified scenic rivers in the coastal zone.

The Taunton River has been designated as a "Partnership Wild and Scenic River." The proposed work within the Taunton River would be designed to the extent practicable with the 2005 Taunton River Stewardship Plan consistent with the National Park Service requirement of the Wild and Scenic Rivers Act.

Protected Areas Policy #3

Ensure that proposed developments in or near designated or registered historic districts or sites respect the preservation intent of the designation and that potential adverse effects are minimized.

Each Build Alternative would be designed to comply with applicable historic preservation standards and include efforts to avoid, minimize and mitigate potential impacts to historic resources. Chapter 4.8, *Cultural Resources*, provides a complete description of the potential impacts to historic resources.

4.18.6.4 Coastal Hazards

Coastal Hazard Policy #1

Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, Land Subject to Coastal Storm Flowage, salt marshes, and land under the ocean.

This policy is not applicable to any of the Build Alternatives because they do not impact coastal landforms.

Coastal Hazard Policy #2

Ensure construction in waterbodies and contiguous land areas will minimize interference with water circulation and sediment transport. Approve permits for flood or erosion control projects only when it has been determined that there will be no significant adverse effects on the project site or adjacent or downcoast areas.

None of the Build Alternatives includes work within coastal waterbodies and none would interfere with water circulation or sediment transport in any coastal waterbody.

Coastal Hazard Policy #3

Ensure that state and federally funded public works projects proposed for location within the coastal zone will:

- not exacerbate existing hazards or damage natural buffers or other natural resources;
- be reasonably safe from flood and erosion related damage;
- not promote growth and development in hazard-prone or buffer areas, especially in Velocity zones and ACECs; and
- not be used on Coastal Barrier Resource Units for new or substantial reconstruction of structures in a manner inconsistent with the Coastal Barrier Resource/Improvement Acts.

The South Coast Rail project would not significantly alter natural buffers in the Coastal Zone and would not promote development in hazard-prone or buffer areas. A small portion of the Weaver's Cove Layover Facility site is within the FEMA flood zone. Project elements proposed for this area are reasonably safe from flood and erosion-related damage.

Coastal Hazard Policy #4

Prioritize public funds for acquisition of hazardous coastal areas for conservation or recreation use, and relocation of structures out of coastal high hazard areas, giving due consideration to the effects of coastal hazards at the location to the use and manageability of the area.

The policy is not applicable to the alternatives.

4.18.6.5 Port and Harbor Infrastructure

The Municipal Harbor Planning process is voluntary, established by the regulations at 301 CMR 23.00 under which municipalities may implement local planning goals for their waterfronts. Harbor plans are prepared in coordination between local officials, the OCZM, DEP, and other state agencies either controlling real property or planning state actions in the harbor planning area.

An approved Municipal Harbor Plan (MHP) is intended to guide state agency actions related to waterfront development, permitting and planning and provides a formal mechanism for local input to the Chapter 91 licensing process. Approved plans may substitute numerical provisions regarding building height, setbacks, open space, and ground floor uses within Commonwealth tidelands.

The South Coast Rail project includes construction activities and changes in use within the geographic planning area for two MHPs:

- New Bedford/Fairhaven Municipal Harbor Plan, and
- Fall River Municipal Harbor and Downtown Economic Development Plan.

The following sections describe the South Coast Rail project's consistency with these MHPs. Subsequent sections demonstrate compliance with the policies contained in Ports and Harbors.

New Bedford/Fairhaven Municipal Harbor Plan

The New Bedford/Fairhaven MHP was prepared through a collaborative effort by the Cities of New Bedford and Fairhaven, the OCZM, MassDEP, and the Seaport Advisory Council. The New Bedford/Fairhaven MHP was approved by the Secretary of Energy and Environmental Affairs on June 14, 2012.

The harbor planning area, shown on Figures 4.18-11 and 4.18-12, includes the existing track extending south from Coggeshall Street (north of the I-195 interchange) to the southern terminus of the New Bedford Main Line near the Whale's Tooth Station. The harbor planning area extends approximately 2,000 to 3,000 feet landward from the watersheet of New Bedford Harbor.

This planning area includes the proposed sites for the Wamsutta Layover Facility and the Whale's Tooth Station. To the extent that these facilities are subject to licensing under Chapter 91, the proposed project elements must be consistent with the approved harbor plan to comply with the provisions of 310 CMR 9.34

Pursuant to 301 CMR 23.05(3), MassDOT has been an active participant in the development of the New Bedford/Fairhaven MHP as it relates to the South Coast Rail project. In February 2010, MassDOT provided written comments to the OCZM that the plan was consistent with their proposed plans and activities.

One of the major initiatives supported by the New Bedford/Fairhaven MHP is: "Improved Transportation Connections including …establishing a passenger rail link to Boston…"

The plan's specific recommendations state that: "The restoration of passenger and freight rail service to the North Harbor creates the landside conditions essential for successful development of expanded port terminal facilities in this area."

The plan recognizes the importance of restoring rail service as a critical component of transportation and industrial infrastructure in the port of New Bedford. The South Coast Rail project supports the New Bedford/Fairhaven Green Ports Initiative and provides intermodal connection to the ferries serving Martha's Vineyard, Cuttyhunk, Woods Hole, and Nantucket via a locally-operated shuttle bus system.

The New Bedford/Fairhaven MHP identifies the combined Whale's Tooth Station as a suitable location to support commuter rail, local and regional bus service, taxis, and waterfront trolley service, and potentially accommodate future rail and pedestrian links to a water terminal.

The New Bedford/Fairhaven MHP concludes by stating that: "The addition of public passenger transport rail enhancements to the existing rail infrastructure at the CSX rail facility represents a significant potential expansion to the economy of the entire region"

In summary, the New Bedford/Fairhaven MHP was developed in collaboration with state agency stakeholders and was reviewed by MassDOT prior to submittal. The plan and the Secretary's Approval Decision recognize the importance of the planned rail improvements to the success of the harbor planning area, the City of New Bedford, and the region.

Fall River Municipal Harbor and Downtown Economic Development Plan

In October 2002, the City of Fall River completed an Economic Development Plan in consultation with a diverse group of regional stakeholders including the OCZM and MassDEP. The Economic Development Plan included the following Statement of Purpose: "The purpose of the Fall River Harbor and Downtown Economic Development Plan is to increase the economic diversity of the community through the expanded use and revitalization of the harbor, the harborfront, and nearby areas within the downtown. The Plan seeks to establish a clear vision for these areas and to create a pragmatic strategy for accomplishing that vision."

The plan was prepared with the goal of obtaining approval by the Massachusetts Secretary of Energy and Environmental Affairs under the provisions of Municipal Harbor Plan Approval (301 CMR 23.00). While the Economic Development Plan was submitted to the Secretary for approval, it was not approved pending further revisions. Therefore, the Economic Development Plan does not meet the regulatory criteria for approved harbor plans and does not serve as formal regulatory guidance for the licensing process.

The South Coast Rail project has been planned and preliminarily designed in a manner consistent with the Fall River Harbor and Downtown Economic Development Plan in terms of supporting water dependent uses and improving public access to the Fall River waterfront while avoiding non-water dependent uses in the DPA or filled tidelands subject to licensing.

The South Coast Rail project includes the reconstruction of track, ballast, water-dependent infrastructure facility crossings and the construction of one new passenger station at Battleship Cove. The station site is well located to meet an overriding vision of the Harbor and Economic Development Plan for the downtown waterfront: "The vision for the waterfront would achieve a higher quality of life by expanding active uses, becoming more accessible to all residents and attracting an increasing number of visitors."

Additionally, the Battleship Cove Station site furthers two specific goals of the harbor plan:

- "The harborfront and the downtown should be enhanced as a visitor destination," and
- "The transportation infrastructure should be focus of appropriate reinvestment that better connects people to their destinations, and supports comprehensive economic goals."

The Battleship Cove Station is centrally located between the densely populated residential neighborhood bounded by Broadway, South Main Street and Kennedy Park. It would be adjacent to the City Gates at Ponta Delgada Park and adjacent to the Water Street/Ferry Street corridor connecting Heritage State Park and Kennedy Park.

The City of Fall River, with assistance from MassDOT, is presently exploring ways to improve pedestrian connections along Fall River's urban waterfront. Critical links being explored at this time include new pedestrian connections between Broadway and Canal Streets to the Battleship Cove Station site and improvements along Water and Ferry Streets. These connections, considered in the context of the planned station, would significantly improve pedestrian access to the waterfront. The Battleship Cove Station would provide new access to the regional transportation network encouraging residents to use these new connections and deliver new visitors to Fall River.

4.18.6.6 Consistency with Designated Port Areas

Massachusetts regulations at 301 CMR 25.00, promulgated pursuant to MGL Chapter 21A, Sections 2 and 4A, established state authority to delineate DPAs within developed industrial waterfronts. The purpose of delineating DPAs is to identify geographic areas of particular state, regional and national significance with respect to the promotion of commercial fishing, shipping and other vessel-related activities associated with waterborne commerce, and of manufacturing, processing, and production activities. Eleven DPAs were subsequently identified by the OCZM and approved by the Secretary of Energy and Environmental Affairs.

The South Coast Rail project includes work in the Mount Hope Bay in Fall River (Figure 4.18-16) and New Bedford/Fairhaven DPAs (Figures 4.18-11 and 4.18-12). These figures show the location of the proposed stations and layover facilities and the regulatory boundaries of these DPAs. The only South Coast Rail project elements within these DPAs are the existing track segments listed in Table 4.18-10.

Table 4.18-10 Project Elements in Designated Port Areas

Designated Port Area	Project Element	Location
Mount Hope Bay	2,000 ± LF of track	South of Weaver's Cove
	500 + LF of track	North of Battleship Cove Station
New Bedford/Fairhaven	500 + LF of track	South of Wamsutta Layover Facility

The South Coast Rail project has been designed to avoid construction of stations and layover facilities within the Mount Hope Bay (Fall River) and New Bedford/ Fairhaven DPAs. The only project-related work proposed within these DPAs is the reconstruction of existing track, ballast, and associated infrastructure.

The CZM regulations include the following port and harbor infrastructure policies and management principles related to projects located in the Massachusetts Coastal Zone:

Ports Policy #1

Ensure that dredging and disposal of dredged material minimize adverse effects on water quality, physical processes, marine productivity and public health.

Ports Policy #2

Obtain the widest possible public benefit from channel dredging, ensuring that designated ports and developed harbors are given highest priority in the allocation of federal and state dredging funds. Ensure that this dredging is consistent with marine environment policies.

These policies are not applicable to the South Coast Rail project because no dredging or disposal of dredged material is proposed within any DPA.

Ports Policy #3

Preserve and enhance the capacity of Designated Port Areas (DPAs) to accommodate water-dependent industrial uses, and prevent the exclusion of such uses from tidelands and any other DPA lands over which a state agency exerts control by virtue of ownership, regulatory authority, or other legal jurisdiction.

The proposed reconstruction of the existing track, ballast and related infrastructure would result in a direct benefit to the DPAs' capacity to support water-dependent industrial uses by improving the railroad transportation infrastructure serving these ports. The South Coast Rail project would improve the load capacity on the New Bedford Main Line from Taunton to the Port of New Bedford and Fall River and provide additional freight transportation capacity to these ports. These improvements would improve the capacity of the DPAs to support water-dependent industrial uses without developing land within the DPA for non-water dependent uses.

Ports Management Principle #1

Encourage, through technical and financial assistance, expansion of water-dependent uses in designated ports and developed harbors, re-development of urban waterfronts, and expansion of visual access.

The proposed improvements within the Mount Hope Bay (Fall River) and New Bedford/Fairhaven DPAs would provide substantial financial assistance to these ports by replacing and upgrading existing rail infrastructure. These upgrades would substantially improve the load capacity of the existing tracks serving these ports increasing the capacity for the DPAs to serve as sea/land intermodal freight node and improve their potential to serve water-dependent industrial uses. The South Coast Rail project has been designed to avoid the construction of any non-water dependent use facilities within the DPAs while substantially improving transportation infrastructure.

The proposed track reconstruction would not adversely affect public views of the shoreline because the work is limited to the reconstruction of existing at-grade railroad infrastructure. No new stations or layover facilities are proposed in any DPA.

4.18.6.7 Public Access

Public Access Policy #1

Ensure that developments proposed near existing public recreation sites minimize their adverse effects.

Public Access Management Principle #1

Improve public access to coastal recreation facilities and alleviate auto traffic and parking problems through improvements in public transportation. Link existing coastal recreation sites to each other or to nearby coastal inland facilities via trails for bicyclists, hikers, and equestrians, and via rivers for boaters.

Redevelopment of commuter rail facilities in Fall River and New Bedford would provide mass transit access to coastal recreational facilities. A station in Fall River is planned to directly service the Battleship Cove Historical Park. Commuter rail service between these coastal areas and Boston would help to alleviate commuter automobile traffic and parking problems. The developed nature of the coastal areas in the project area is not suitable for trail development. The rail embankment does not have sufficient width to incorporate a trail system, and the proximity to high speed rail traffic would not be prudent from a safety perspective. The use of existing, active rail segments within the Coastal Zone does not preclude development of any proposed public access paths in this area.

Public Access Management Principle #2

Increase capacity of existing recreation areas by facilitating multiple uses and by improving management, maintenance and public support facilities. Resolve conflicting uses whenever possible through improved management rather than through exclusion of uses.

This Management Principle is not applicable to the alternatives.

Public Access Management Principle #3

Provide technical assistance to developers of private recreational facilities and sites that increase public access to the shoreline.

This Management Principle is not applicable to the alternatives.

Public Access Management Principle #4

Expand existing recreation facilities and acquire and develop new public areas for coastal recreational activities. Give highest priority to expansions or new acquisitions in regions of high need or limited site availability. Assure that both transportation access and the recreational facilities are compatible with social and environmental characteristics of surrounding communities.

This Management Principle is not applicable to the alternatives.

4.18.6.8 Energy

Energy Policy #1

For coastally dependent energy facilities, consider siting in alternative coastal locations. For non-coastally dependent energy facilities, consider siting in areas outside of the coastal zone. Weigh the environmental and safety impacts of locating proposed energy facilities at alternative sites.

This policy is not applicable to the alternatives.

Energy Management Principle #1

Encourage energy conservation and the use of alternative sources such as solar and wind power in order to assist in meeting the energy needs of the Commonwealth.

The proposed project would support this Management Principle by encouraging the use of public transportation and reducing dependency on automobiles. This project would provide the opportunity to use alternative energy sources such as wind or solar power at the proposed stations or for future transit-oriented development.

4.18.6.9 Ocean Resources

Ocean Resources Policy #1

Support the development of environmentally sustainable aquaculture, both for commercial and enhancement (public shellfish stocking) purposes. Ensure that the review process regulating aquaculture facility sites (and access routes to those areas) protects ecologically significant resources (salt marshes, dunes, beaches, barrier beaches, and salt ponds) and minimizes adverse impacts upon the coastal and marine environment.

This policy is not applicable to the alternatives.

Ocean Resources Policy #2

Extraction of marine minerals will be considered in areas of state jurisdiction, except where prohibited by the MA Ocean Sanctuaries Act, where and when the protection of fisheries, air and marine water quality, marine resources, navigation and recreation can be assured.

This policy is not applicable to the alternatives.

Ocean Resources Policy #3

Accommodate offshore sand and gravel mining needs in areas and in ways that will not adversely affect shorelines areas due to alteration of wave direction and dynamics, marine resources and navigation. Mining of sand and gravel, when and where permitted, will be primarily for the purpose of beach nourishment.

This policy is not applicable to the alternatives.

4.18.6.10 Growth Management

Growth Management Principle #1

Encourage, through technical assistance and review of publicly funded development, compatibility of proposed development with local community character and scenic resources.

The proposed restoration of passenger rail service to Fall River and New Bedford is compatible with the local character and scenic resources and Harbor Master Plan. Fall River and New Bedford are preparing Master Plans that incorporate commuter rail service. Additional information on the project's smart growth corridor plan and the compatibility of the proposed development with the surrounding land uses can be found in the *South Coast Rail Economic Development and Land Use Corridor Plan.*[2]

Growth Management Principle #2

Ensure that state and federally funded transportation and wastewater projects primarily serve existing developed areas, assigning highest priority to projects that meet the needs of urban and community development centers.

The Build Alternatives would improve the transportation options for the existing developed areas of Fall River and New Bedford, and link these areas with the developed urban centers of Boston and Taunton. Enhancing transportation choice is one of the sustainable development principles that is addressed in the *South Coast Rail Economic Development and Land Use Corridor Plan.*[3]

Growth Management Principle #3

Encourage the revitalization and enhancement of existing development centers in the coastal zone through technical assistance and federal and state financial support for residential, commercial and industrial development.

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[2] Commonwealth of Massachusetts. 2009. South Coast Rail Economic Development and Land Use Corridor Plan, DRAFT June 29, 2009. Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston.

[3] Commonwealth of Massachusetts. 2009. South Coast Rail Economic Development and Land Use Corridor Plan, DRAFT June 29, 2009. Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston.

The Build Alternatives are consistent with this is policy since improvement of transportation options serving Fall River and New Bedford would encourage residential, commercial and industrial development within these coastal communities. Transit-oriented development is specifically addressed in the *South Coast Rail Economic Development and Land Use Corridor Plan.*[4]

4.18.6.11 Summary

Depending on the alternative selected, the project is expected to require several licenses for bridges, stations and layover facilities. Additional approvals would be required for bridge, track and ballast improvements at existing railroad crossings of non-tidal rivers and streams. The jurisdiction of many of these crossings would be determined during further consultation with DEP and the United States Coast Guard.

The alternatives are anticipated to comply with the policies and principles of the Massachusetts Coastal Zone Management Program. The alternatives would support water-dependent industrial uses within the New Bedford and Mt. Hope Bay DPAs by maintaining a critical transportation system supporting these uses.

The Build Alternatives would require a Federal Consistency Certification under the Massachusetts Coastal Zone Management Plan. It is anticipated that the alternatives would be consistent with the applicable policies.

4.18.7 Planning for Sea Level Rise

The Secretary's Certificate on the DEIR and the Waterways Regulations at 310 CMR 9.37(2) require MassDOT to consider potential sea level rise in designing and licensing projects subject to Chapter 91.

The Massachusetts Climate Change Adaptation Report prepared by the Executive Office of EEA and the Office of Coastal Zone Management provides a comprehensive review of potential sea level rise in Massachusetts. This report considered the potential changes in sea level based on several generally accepted climate models and their predictions representing a range of model inputs (i.e., high and low emission rates, precipitation, atmospheric CO_2 and temperatures). Based on this analysis the report cites a potential change in sea level of 8 to 16 inches (0.6 to 1.6 feet) by 2050 and approximately 23 to 79 inches (1.9 to 6.6 feet) by 2100.

The South Coast Rail project elements subject to licensing and therefore required to comply with 310 CMR 9.37(2) are limited to certain non-tidal river and stream crossings and the Weaver's Cove East Layover Facility. The majority of the non-tidal river and stream crossings is not adjacent to the shoreline and would not be expected to be subject to inundation due to a sea level rise of up to the 16 inches predicted by 2050.

The Weaver's Cove East Layover Facility would be located approximately 20 feet above the current shoreline and would not be expected to experience inundation even under the highest predicted sea level rise of 6.6 feet by 2100.

[4] Ibid.

5 INDIRECT EFFECTS AND CUMULATIVE IMPACTS

5.1 INTRODUCTION

MassDOT's stated purpose of the South Coast Rail project is to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts to enhance regional mobility, while supporting smart growth planning and development strategies in affected communities.

The South Coast region includes 31 Massachusetts communities with a combined population of approximately 740,000. The regional population is projected to grow to more than 928,000 by 2035, making the South Coast one of the fastest growing regions of the state. As documented in the *South Coast Rail Economic and Land Use Corridor Plan*[1] (Corridor Plan), the South Coast Rail project is anticipated to result in economic benefits and growth in jobs and households within the South Coast region. While these changes are economically beneficial, induced growth is likely to affect land use and other resources. MassDOT has therefore incorporated smart growth planning into the project to provide communities with the opportunity to organize new growth and direct it away from sensitive areas of ecological value. The region envisions a future with renewed and expanded urban centers, new walkable neighborhoods, and natural areas that are preserved for future generations.

The following indirect effects and cumulative impacts analysis is consistent with the CEQ and other agency guidance documents, including:

- Considering Cumulative Effects Under the National Environmental Policy Act[2]
- Guidance on the Consideration of Past Actions in Cumulative Effects Analysis[3]
- Interim Guidance: Questions and Answers Regarding Indirect and Cumulative Impact Considerations in the NEPA Process[4]
- Consideration of Cumulative Impacts in EPA Review of NEPA Documents[5]

The indirect (or secondary) effects analysis is focused on induced household and employment growth that may result from increased transportation access in the South Coast region. The cumulative impact analysis evaluates changes within the study area as a result of past, present, and reasonably foreseeable future actions combined with the South Coast Rail project.

5.1.1 Regulatory Context and Definitions

The requirement to analyze the direct, indirect and cumulative impacts of proposed federal actions was established in the CEQ regulations implementing NEPA. This section summarizes key definitions and

[1] Goody Clancy 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Goody Clancy: Boston, MA. June 2009.

[2] Council on Environmental Quality. 1997. *Considering Cumulative Effects Under the National Environmental Policy Act.* Executive Office of the President, Council on Environmental Quality: Washington, D.C. January 1997.

[3] Council on Environmental Quality. 2005. *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.* , Executive Office of the President, Council on Environmental Quality: Washington, D.C. June 24, 2005.

[4] Federal Highway Administration. 2003. *Interim Guidance: Questions and Answers Regarding Indirect and Cumulative Impact Considerations in the NEPA Process*. US Department of Transportation, Federal Highway Administration: Washington, D.C. January 31, 2003.

[5] Environmental Protection Agency. 1999. *Consideration of Cumulative Impacts in EPA Review of NEPA Documents.* EPA 315-R-99-02. US Environmental Protection Agency, Office of Federal Activities: Washington, D.C. May 1999.

requirements related to indirect effects and cumulative impacts from the CEQ NEPA regulations, agency guidance documents, and court decisions. It should be noted that "effects" and "impacts" as used in the CEQ regulations are synonymous and can be positive or negative (40 CFR 1508.8).

5.1.1.1 Direct Effects

According to the CEQ's regulations implementing NEPA, direct effects are "caused by the action and occur at the same time and place" (40 CFR 1508.8). Direct effects are typically well understood and predictable. Examples of common direct effects for transportation projects include residential and business displacements, filling of wetlands to construct rail infrastructure, and removal of a historic structure.

5.1.1.2 Indirect Effects

Indirect effects "are caused by the action and are later in time and/or farther removed in distance, but are still reasonably foreseeable." Indirect effects "may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8). The National Cooperative Highway Research Program's (NCHRP) *Report 466: Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* identifies two primary types of indirect effects—induced growth (or growth influencing) and encroachment-alteration.

Induced growth type indirect effects are changes in the location and/or magnitude of future development attributed to changes in accessibility caused by the transportation project. Accessibility is the ease of movement from an origin (to all other places) or as a destination (from all other places). Transportation improvements change accessibility by reducing the time cost of travel between destinations. Changes in accessibility can affect the location decisions of residents and businesses if favorable economic, regulatory and infrastructure conditions are also supportive of new development. An example of an induced growth type indirect effect is commercial development occurring around a new rail station and the environmental impacts associated with this development. The transportation project is a necessary condition for this development to occur (by providing new or improved access), but is not a sufficient condition. In order for the development to occur, it also requires favorable conditions that may include:

- economic conditions that support development (e.g., markets, acceptable rate of return on investment in land purchase, design, construction, and other costs);
- zoning and other land use controls and policies suitable for the type of development suggested by market conditions;
- other infrastructure that supports development (e.g., water and sewer service); and
- amenities (e.g., good schools, access to recreational opportunities).

Encroachment-alteration indirect effects are physical, chemical or biological changes in the environment as a result of the project removed in time or distance from the direct effects. An example of an encroachment-alteration indirect effect would be a long-term decline in the viability of a population of a particular species as a result of habitat fragmentation caused by the project. Encroachment-alteration effects such as habitat fragmentation or changes in water quality are addressed in the resource-specific chapters of this FEIS/FEIR (e.g. Biodiversity, Wildlife and Vegetation, Water Resources, etc.).

Regardless of the type of indirect effect, case law has established that NEPA documents need to address indirect effects that are likely or probable.[6] Speculation on indirect effects that are merely possible is not required. In Sierra Club v Marsh 769 F. 2d 763 (1985), the Court set forth a three-part test to determine if a particular set of impacts is definite enough to take into account, or too speculative to warrant consideration:

- With what confidence can one say that the impacts are likely to occur?
- Can one describe them now with sufficient specificity to make their consideration useful?
- If the decision maker does not take them into account now, will the decision maker be able to take account of them before the agency is so firmly committed to the project that further environmental knowledge, as a practical matter, will prove irrelevant to the government's decision?

Where economic development is an explicit part of the project purpose, the indirect effects analysis should also consider the environmental effects of this development.

5.1.1.3 Cumulative Impacts

A cumulative impact is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). According to the FHWA's *Interim Guidance: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process,*[7] cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a proposed project.

Cumulative impact analysis is inherently resource-specific and frequently regional in scale. CEQ's *Considering Cumulative Effects under the National Environmental Policy Act* envisions cumulative impact analysis as a tool for evaluating the implications of project-level decisions on the status or health of regional resources. According to the USEPA, an adequate cumulative effects analysis of impacts that are due to past, present, and reasonably foreseeable future actions needs to consider the following factors: 1) whether the environment has been degraded, and if so, to what extent; 2) whether ongoing activities in the area are causing impacts; and 3) the trends for activities and impacts in the area.[8]

To determine what information is relevant to include in a cumulative impact analysis, sufficient scoping and research should reveal those actions that are "relevant to reasonably foreseeable significant adverse impacts" and are "essential to a reasoned choice among alternatives," and can be obtained without exorbitant cost.[9]

A cumulative impact analysis should identify:

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[6] See NCHRP 25-25 Task 43 Legal Sufficiency Criteria for Adequate Indirect Effects and Cumulative Impacts Analysis as Related to NEPA Documents, 2008.

[7] Available online at: http://www.environment.fhwa.dot.gov/projdev/qaimpact.asp.

[8] USEPA. "Consideration of Cumulative Impacts in EPA Review of NEPA Documents," Office of Federal Activities (2252A). Document No. EPA 315-R-99-002. May, 1999.

[9] Connaughton, J.L., "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis." Memorandum to Heads of Federal Agencies. June 24, 2005.

- the area in which the effects of the proposed project will be felt;
- the impacts that are expected in that area from the proposed project;
- other past, present, and reasonably foreseeable actions that have or are expected to have impacts in the area;
- the impacts or expected impacts from these other actions; and
- the overall impact that can be expected if the individual impacts are allowed to accumulate.

"Reasonably foreseeable future actions" for the purpose of cumulative impact analysis are probable or likely, not merely possible.

5.1.2 Massachusetts Environmental Policy Act Requirements

The MEPA regulations at 301 CMR 11.07(6) (h) require that an EIR evaluate the cumulative effects of a proposed project. The Secretary's Certificate on the ENF required that the DEIR include several specific analyses and information, listed below.

- The DEIR should present an analysis of the secondary and cumulative impacts, both positive and negative, related to induced growth in communities affected by the rail and bus alternatives, and explain how implementation of the Corridor Plan is expected to mitigate potential adverse impacts.
- Each of the alternatives should be evaluated under three different scenarios, including the full build with mitigation, i.e., implementation of the Corridor Plan. The full range of potential environmental impacts associated with implementation of this plan should be evaluated including impacts to biodiversity, wetlands, endangered species, air quality and greenhouse gas (GHG) emissions, transportation, municipal infrastructure, and water resources.
- The DEIR should define the study area for evaluation of secondary growth impacts and explain the rationale for the boundaries selected.
- The DEIR should discuss different scenarios for induced growth and explain how this has been incorporated in modeling for the alternatives analysis
- The DEIR should discuss different scenarios and include projections of where growth is expected to occur, and at what rate, under each of the alternatives.
- The DEIR should identify areas where sprawl may occur under certain alternatives and include mitigation plans to concentrate development and protect natural resources.
- The DEIR should evaluate the alternatives on the basis of other smart growth principles, including conservation of open space and use of existing infrastructure.
- The DEIR should discuss the trade-offs inherent in project alternatives, such as increased impacts on certain resources for environmental benefits in other areas.

- The DEIR should include details on specific mechanisms that will be used to ensure that the smart growth goals of the project will be realized, including funding commitments and mechanisms for conservation of PPAs and acquisition and development of PDAs.

- The DEIR should describe in detail how land use will be controlled and priority conservation areas permanently protected.

- The DEIR should clarify indicators and metrics to be used for evaluation of smart growth, and propose a long-term monitoring and evaluation plan.

- The DEIR should describe specific strategies and resources, including state funding commitments, to ensure successful implementation of the Corridor Plan.

- The DEIR should describe the tools and resources needed by individual communities to take advantage of the economic development potential of the proposed rail line in a manner that protects critical resources and is consistent with the Commonwealth's Sustainable Development Principles.

- The DEIR should also include information on any municipal land use or policy commitments that have been made.

- With respect to secondary growth impacts, each alternative should be analyzed under three different scenarios: (1) the baseline condition, which evaluates environmental conditions in the absence of the proposed rail under the assumption that current travel and development patterns continue and there are no changes in municipal zoning, (2) build without mitigation, which evaluates impacts, including induced growth, associated with each alternative in the absence of transit-oriented development (TOD), green building, zoning changes, transfer of development rights, wetlands restoration, habitat protection, or other mitigation measures, and (3) build with mitigation, which evaluates impacts associated with the alternatives assuming implementation of the Corridor Plan, TOD in and around the stations, habitat protection (including priority protection areas, PPAs) and other proposed mitigation.

- The DEIR should include an assessment of costs associated with implementation of the smart growth aspects of the project for each alternative, to fully understand the overall costs and rationale for selection of alternatives.

The Secretary's Certificate on the DEIR requested additional information on smart growth mitigation measures and the implementation of the Corridor Plan. This information is provided in Section 5.5.

5.1.3 Organization of this Chapter

Section 5.2 presents the methods used to assess indirect effects and cumulative impacts for each of the alternatives. Section 5.3 presents indirect effects assessment for the No-Build Alternative and the build alternatives under two scenarios—without smart growth measures, and with the implementation of the South Coast Rail Economic Development and Land Use Corridor Plan (the Plan). Section 5.3 also provides a description of the Plan and the smart growth measures that are included in the South Coast Rail alternatives. Section 5.4 provides an analysis of the cumulative impacts of the South Coast Rail alternatives on natural, social, cultural, and physical resources.

5.2 METHODOLOGY

5.2.1 Indirect Effects

This section identifies the methodology and assumptions for the analysis of indirect effects.

5.2.1.1 Introduction

Potential indirect effects (beneficial and adverse) of the Build Alternatives were evaluated with and without smart growth measures (including TOD). The Corridor Plan was the guiding land use development plan for this analysis. The Commonwealth provides a number of grant programs that support smart growth from economic development to land preservation. The Massachusetts Executive Office of EEA has developed a Smart Growth/Smart Energy Toolkit,[10] which includes tools, model bylaws, and other resources to help local planners control sprawl/encourage smart growth.

The analyses consider reasonably foreseeable indirect effects, from project initiation in 2016 through the planning period ending in 2035, from implementing the South Coast Rail project. Induced growth that would result from the Build Alternatives includes the creation of new residential development and jobs. In order to assess the indirect effects of this induced growth, two scenarios were developed to allocate growth in the South Coast region. The first scenario, Scenario 1, allocates induced growth under business as usual conditions, includes baseline conditions, and assumes that induced growth would occur in a traditional pattern.

The second scenario, Scenario 2, assumes that growth would be directed to Priority Development Areas (PDAs) and away from PPAs, based on the planning efforts of each municipality in the South Coast region. It includes the baseline growth, project-induced growth, and goals of the Corridor Plan. For some analyses, Scenario 2 was evaluated based on high and low levels of implementation of smart growth measures. The allocation of each growth scenario was then viewed in terms of its impact on natural, social, cultural, and physical resources as compared to the No-Build Alternative.

Each analysis relies on data provided in the Corridor Plan, information provided by the three regional planning agencies (RPAs) in the South Coast region, and information developed by MassDOT. The analysis identifies potential changes in land use, infrastructure requirements (water, sewer, etc.) under each scenario and the social and economic environment that would likely result from growth induced by the new transit system. Based on the anticipated changes in land use, potential impacts to selected environmental resources are estimated.

Each of the two build scenarios have been evaluated regionally for a range of potential impacts, based on the option with the largest projected ridership: the Stoughton Electric Alternative. The Whittenton Alternative was not evaluated, because its effects would be similar in magnitude and location to the Stoughton Electric Alternative. The indirect effects analysis in this FEIS/FEIR therefore assumes that these two alternatives are equivalent because the same level of induced growth distributed among the municipalities is expected.

[10] EOEEA. 2009. Available online at: http://www.mass.gov/?pageID=eoeeamodulechunk&L=1&L0=Home&sid=Eoeea&b=terminalcontent&f=eea_sgse_toolkit&csid=Eoeea. Accessed 27 May 2009.

5.2.1.2 Study Area

The study area for the indirect effects assessment is based on the area where induced growth would be likely to occur as a result of the South Coast Rail project (the "commuteshed"). The commuteshed includes the 31 Massachusetts communities in the Corridor Plan and four communities in southeastern Rhode Island that could potentially be served by a rail station in Fall River (Table 5.2-1). All communities are within a reasonable commuting distance of the proposed rail corridors and transit stations.

Table 5.2-1 Indirect Effects Study Area Municipalities

Regional Planning Agency	Municipalities	
Metropolitan Area Planning Council	*Canton*[1]	*Sharon*
	Foxborough	*Stoughton*
Old Colony Planning Council	*Bridgewater*	
	Easton	
	Stoughton[2]	
Southeast Regional Planning and Economic Development District	Acushnet	New Bedford
	Attleboro	*North Attleborough*
	Berkley	*Norton*
	Dartmouth	Raynham
	Dighton	Rehoboth
	Fairhaven	Rochester
	Fall River	Seekonk
	Freetown	Somerset
	Lakeville	Swansea
	Mansfield	Taunton
	Marion	Wareham
	Mattapoisett	Westport
	Middleborough	
Rhode Island	Bristol	Tiverton
	Portsmouth	Warren

1 Communities in italics are the "SCR 10" northern communities.
2 Stoughton is shared between Metropolitan Area Planning Council and Old Colony Planning Council.

5.2.1.3 No-Build (Enhanced Bus) Alternative

Conditions under the future No-Build Alternative (in 2035), based on the regional plans of the MAPC, the OCPC, and SRPEDD, have been developed to establish baseline conditions by which to assess the effects of the Build Alternatives under the scenarios discussed below. Smart growth measures already adopted by communities, irrespective of the South Coast Rail project, have also been incorporated in this baseline.

5.2.1.4 Scenario 1 – Indirect Effects without Smart Growth Measures

The analysis considers reasonably foreseeable indirect effects from implementing the South Coast Rail project without smart growth strategies, including TOD. Induced growth, both within immediate proximity of station areas and in nearby communities that are served by each station, has been estimated based on literature review and regional growth projections:

- Growth projections of jobs and households from SRPEDD, OCPC, and MAPC;
- Induced growth estimates of jobs and households from the Transportation Economic Development Impact System Model (TREDIS)[11] were projected by calculating the percentage of total 2030 Scenario 1 growth comprised by each municipality's 2030 No-Build Alternative and 2030 Scenario 1 growth projections, and applying the municipality-specific percentage from the 2035 No-Build Alternative to project 2035 Scenario 1 growth;
- Distribution of jobs and households in the region from the Corridor Plan and SRPEDD, MAPC, OCPC, and Regina Villa Associates; and
- Job growth projections were not previously available for Dartmouth and Wareham. Therefore the following assumptions were applied to calculate projected 2035 job growth in these municipalities. In order to arrive at projected 2035 job growth, the 2000 municipal population was multiplied by the average 2035 job growth per capita of nearby towns.

MassDOT has developed projections for induced growth in jobs and households broken down into three regions: Suffolk County/Cambridge, SCR 10[12] (the northern communities) and SCR 21[13] (the South Coast communities). Projections were also made for the four Rhode Island communities that are expected to have commuters utilizing the potential new transit service. This is growth that would not occur without the transit investment. In 2010, MassDOT prepared new regional projections of population and employment growth. The RPAs then updated their projections at the municipal level based on these revised figures.

Induced Jobs

The TREDIS model provides projections for new jobs according to the North American Industry Classification System (NAICS) employment classification system. Comparisons between the location quotients of the current distribution of jobs by consolidated NAICS job codes with the estimated distribution of the induced jobs allowed for projections to be made for the number and sub-regional geographic distribution of new jobs.

Data used to inform the allocation include:

- ridership data provided by the Central Transportation Planning Staff (CTPS) from the Boston Region Metropolitan Planning Organization, RPA demographic projections, and regional economic data sets;
- existing employment centers by sector: for example, the communities with the highest regional share of manufacturing jobs are expected to attract the majority of new manufacturing jobs;
- current trends: communities that have strong growth in particular job sectors are expected to continue attracting jobs from those sectors; and

[11] The Transportation Economic Development Impact System Model (TREDIS) is a web-based analysis system used to analyze planned transportation investments. The model works by utilizing a series of modules that compare project impacts and project benefits.

[12] SCR 10 communities: Attleboro, Bridgewater, Canton, Easton, Foxborough, Mansfield, North Attleborough, Norton, Sharon, and Stoughton.

[13] SCR 21 communities: New Bedford, Acushnet, Berkley, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, Lakeville, Marion, Mattapoisett, Middleborough, Raynham, Rehoboth, Rochester, Seekonk, Somerset, Swansea, Taunton, Wareham, and Westport.

- zoning, infrastructure capacity, land availability, and transportation access: industrial parks and other job centers that have the appropriate zoning, infrastructure, and land available for expansion are likely to capture a significant share of this new growth.

To estimate the number of induced jobs under Scenario 1, total jobs were first projected by the model for the sub-regions and then distributed to the municipal level.

Unlike housing, which tends to be distributed more diffusely throughout the region, jobs are more strongly tied to existing job centers and less so to proposed station sites. Manufacturing jobs, for example will be clustered in industrial parks and other areas so zoned. Health occupations tend to congregate in hospitals and other medical campus settings. Consolidated NAICS job sector codes were used to group jobs into larger categories. For example, the NAICS codes between 541 and 551 were combined to create the Professional, Scientific, and Technical Services category—one of the sectors estimated to experience significant growth related to the restoration of transit service. A job share for each consolidated NAICS sector was then calculated for each city and town.

SRPEDD analyzed labor and workforce data for the consolidated job sectors for all communities between 2001 and 2008. An eight-year sector average was developed for each category for each municipality. These data reveal which communities have clusters of industry and, because it is an average over the eight-year time period, smooths out any anomalous years and captures recent trends. The eight-year jobs sector average by community was used to allocate the induced jobs in SCR 10 and SCR 21 communities.

To incorporate the expected influence of the transportation routes, a normative scoring system was used to take into account the relative influence the route alternative is likely to have on a given municipality. This system was developed by a working team consisting of the RPAs and project consultants. A community designated as likely to be strongly influenced, moderately influenced, or to experience limited influence. Communities were designated as strongly influenced if they would contain a new station or if the access to transportation service is improved. Moderate influence designations went to communities likely to experience less significant influence—those that are reasonably close to greatly expanded service or those communities that would see modest improvements in service. Finally, communities were assigned to limited influence if little or no change is expected to existing transportation service or if they are remotely located from new service.

Fifty percent of the induced jobs assigned to the communities that would experience a limited influence were then reassigned equally to the strongly influenced communities. The limited influence communities are the farthest away from the service improvements and would have the least benefit from transit improvements. On the other hand, the strongly influenced communities are expected to see more housing development and job opportunities as a result of the South Coast Rail project.

Because the TREDIS model's study area did not include any communities in Rhode Island, an estimate of the induced job growth for the Rhode Island communities was made by calculating the proportional growth the communities' Massachusetts neighbors would receive. Bristol and Portsmouth were assigned the same growth rate as Swansea; Tiverton to Westport; and Warren to Seekonk.

Induced Households

Similar to the effects on job creation, expanded and improved transportation access would increase the potential for new households to locate in the region. Some households are likely to be attracted to new

employment opportunities. Other households would be attracted to the relatively less expensive housing markets farther south of the Greater Boston area. Expected household growth for each of the alternatives was calculated by the Economic Development Research Group, Inc. A summary report, including a description of their methodology, is included in Appendix 5.2-A.

Factors considered in allocating induced households included:

- Ridership origination. Using ridership data produced by CTPS, areas that are now within a 20-minute drive of new stations are expected to generate new households. Communities within the northern portion of the corridor are already within a 20-minute commute to the stations of the Old Colony Line to the east and the Northeast Corridor to the west. Induced growth in this geography is more likely to be concentrated closer to new transit stations.

- Service time. Train and bus service times double in frequency north of the Southern Triangle (in Taunton).

- Housing costs. Housing costs generally decrease south of Mansfield providing more opportunity for home ownership and larger homes.

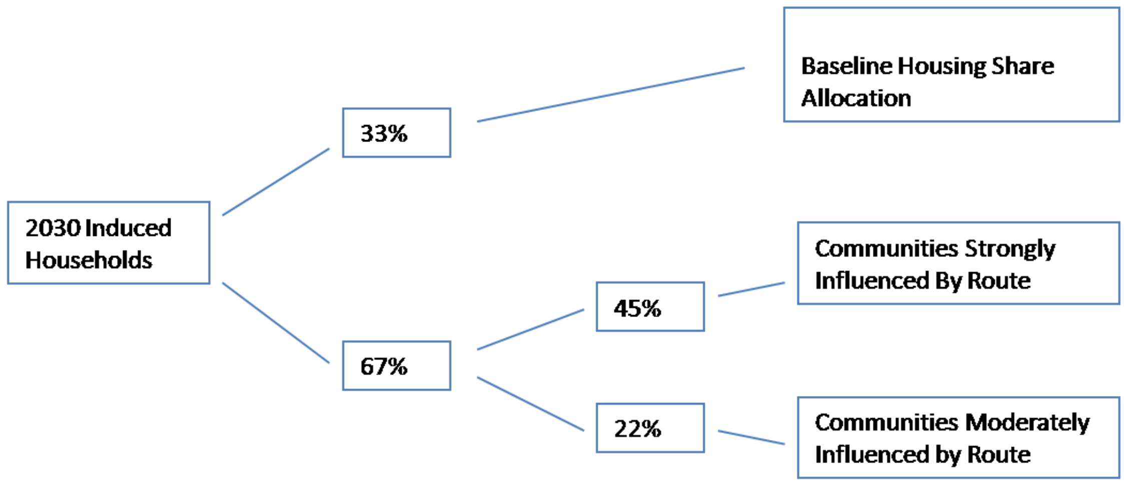
- Employment center midpoints. Large concentrations of jobs are found in Greater Boston, Providence, Fall River, New Bedford, Taunton, and Attleboro. Households with two workers often seek to live in the midpoint for the two commutes.

- Population concentration and growth trends. New household locations are likely to follow existing growth trends and are less likely to be absorbed into communities approaching build out.

- Zoning, infrastructure and land availability. The availability of land zoned for residential development and infrastructure capacity to support new development are other important factors. Some communities have zoning and capacity for additional multifamily units, while the more semi-rural communities are zoned for large lots and rely on private wells and septic tanks for wastewater disposal.

An expert team of RPA representatives and project consultants arrived at a general agreement at a working session on August 26, 2009, on how to use household concentrations over time to capture trends in housing location throughout the South Coast region. Similar to the jobs allocation, it uses a normative assessment of how likely each community is to be affected by the various transportation routes. Communities were designated as likely to be strongly influenced, moderately influenced, or to experience limited influence.

The following flowchart illustrates how households were allocated under Scenario 1.



Because household growth estimates are broken into the two SCR sub-regions, the allocation at the municipal level was undertaken for the SCR 10 and SCR 21 communities separately. First, each municipality's share of the households in 2010 was calculated based on U.S. Census data. Second, each municipality's share of projected growth in households from 2010-2035 was calculated. These two shares were averaged to create a baseline housing share that captures existing housing concentrations and projected growth in households. One-third (33 percent) of the induced households were allocated according to this baseline share. This part of the allocation depends on existing and projected regional housing characteristics and not on any specific alternative. The remaining two-thirds (67 percent) were allocated according to the expected influence of the Build Alternatives. This process takes into account residential development opportunities in some communities within easy drive-time distances of the new stations. At the same time, this approach discounts the expected impacts for the communities farther away from a particular route.

Each community was assigned a designation of strongly influenced, moderately influenced, or limited influence for each of the Build Alternatives. The RPAs and project consultants assigned these values to South Coast study area municipalities. Communities were designated as strongly influenced if they would contain a new station or if the access to transportation service is improved. Moderate influence designations went to communities likely to experience less significant impacts—those that are reasonably close to greatly expanded service or those communities that would see modest improvements in service. Finally, communities were assigned to limited influence if little or no change is expected due to local transportation service or if they are remotely located from new service. The remaining two-thirds of the households were allocated based on these designations—45 percent of the original total went to the strongly influenced communities and the remaining 22 percent of the original total were allocated to the moderately influenced communities. Previously, 33 percent of the households were allocated according to the baseline share, which results in a 100 percent allocation of households.

An estimate of the induced household growth for the Rhode Island communities was made by calculating the proportional growth the communities' Massachusetts neighbors would receive. Bristol

and Portsmouth were assigned the same growth rate as Swansea; Tiverton to Westport; and Warren to Seekonk.

5.2.1.5 Scenario 2 – Indirect Effects with Smart Growth Measures

The Corridor Plan outlines a future of more sustainable development patterns across the South Coast region. This smart growth plan envisions housing and jobs clustered in areas appropriate for development, while preserving important natural resource lands such as fields, forests, farmland, and wetlands. Outcomes of the Corridor Plan would include the creation of new multifamily housing developments and neighborhoods of tightly clustered single family homes in closer proximity to transportation options and mixed use centers that contain professional offices, retail stores, restaurants, and employment opportunities. Denser, mixed use development patterns would yield measurable benefits for the environment. Local governments can support the smart growth vision by altering current zoning laws to permit denser development and streamline permitting requirements. The Commonwealth supports smart growth efforts through grant programs and technical advice. Information on its Smart Growth/Smart Energy Program can be found at http://www.mass.gov/envir/smart_growth_toolkit/. USEPA also as programs supporting smart growth, see: http://www.epa.gov/dced/index.htm. The Corridor Plan identifies PDAs and PPAs, capturing the strongest candidates for development and preservation, as shown on the Corridor Map (Figure 5-1). The goals outlined on this map can be realized through coordinated state investments and local actions, such as rezoning and regulatory changes.

As part of the environmental review process the impacts of the No-Build Alternative were compared to the Build Alternatives. There are many potential smart growth scenarios that could unfold through 2035. It is impossible to predict with any certainty the future development or preservation outcomes for particular PPAs. However, it is possible to explore one theoretical smart growth scenario for the purposes of comparing the impacts between the No-Build and Build Alternatives. Any such exercise necessarily requires a series of assumptions to be made regarding the type and location of future growth. The following assumptions were made before constructing the smart growth model:

- Infrastructure constraints will be overcome within reason; the Commonwealth help will support infrastructure investments to realize more compact development;
- Local rezoning can be expected to occur for PDAs to accommodate higher levels of development and different permitted uses; and
- A greater mix of multifamily and smaller-lot single-family units will be developed under the smart growth scenario.

This analysis considers the reasonably foreseeable indirect effects of the South Coast Rail project with smart growth strategies (i.e., measures that MassDOT can implement and/or growth management strategies that are anticipated to be adopted by study area municipalities by 2035). It was assumed that proposed stations are designed to optimize TOD opportunities with the full range of smart growth measures as provided in the Corridor Plan and regional long-range plans.

The smart growth scenario includes all projected baseline (No-Build) and induced growth in jobs and households across the South Coast region. A working group of consultants and planners from the three RPAs constructed this theoretical model with the assistance of Geographic Information Systems (GIS) mapping techniques and ground-truthing by regional planners.

Under the smart growth scenario, jobs were allocated by the RPAs into traffic analysis zones (TAZs) based on the share of jobs projected in 2035. This allocation will permit future impact analyses of the induced jobs in the context of traffic and GHG emissions. Growth was redistributed using the process described in this section.

At the heart of the Corridor Plan is the Corridor Map, which identifies appropriate places for development and preservation (PDAs and PPAs). The smart growth model uses these districts as the base geographies for the reallocation of housing and jobs. All state-endorsed PDAs were designated to receive a portion of the reallocation, as were some regionally identified PDAs. Regional PDAs were included in the model if they were particularly well suited for smart growth development, such as downtowns. If a community did not have a state-endorsed PDA, the RPA included a regional priority area from the community that, in their professional judgment, represented the strongest opportunity for smart growth development.

The literature examining smart growth policies and planning has shown that approximately 30 percent of households[14] are attracted to the characteristics that comprise smart growth development—chiefly, compact, mixed-use development, and proximity to public transit, among other benefits. Originally, MassDOT proposed to reallocate 30 percent of the projected growth from the PPAs and Neutral Areas into PDAs. Reflecting the proposed state and local smart growth actions as identified in the Corridor Plan focus on the priority areas, the 30 percent reallocation assumption was modified to reflect this more nuanced approach to development and preservation activities. The working assumption is to shift 50 percent of the current predicted growth (baseline plus induced) of households and jobs in PPAs and 25 percent of the current predicted growth (baseline plus induced) of households and jobs in the neutral areas to the PDAs. This actually results in slightly less than the original 30 percent reallocation because less growth has been projected for the outlying protection areas.

Figure 5-2 illustrates how households and jobs were allocated under Scenario 2. The following "rules" were used in the Scenario 2 re-allocations:

- Acres of developable land were calculated for the PDAs.
- Only PDAs that have potential for residential or mixed-use development were considered for the reallocation of households and PDAs that are solely residential did not receive any reallocated jobs.
- The RPA current trends projections from 2010 to 2035 include households at the TAZ level. For each TAZ that falls outside a PDA, 30 percent of the projected growth from 2010 to 2035 under the No-Build scenario was redirected to the PDAs.
- A TAZ was considered within a PDA if 50 percent or more of its land area falls within the PDA border.
- If a municipality cannot hold projected growth in its PDA, a transfer was made to another PDA. The first transfer was intra-municipal. New households were shifted from non-PDA TAZs to the PDAs within a municipal boundary.

[14] Leinberger, C.B. *The Option of Urbanism: Investing in a New American Dream*. Washington, DC: Island Press, 2008. p. 92-101.

Figure 5-2 Household and Job Allocation Model under Scenario 2

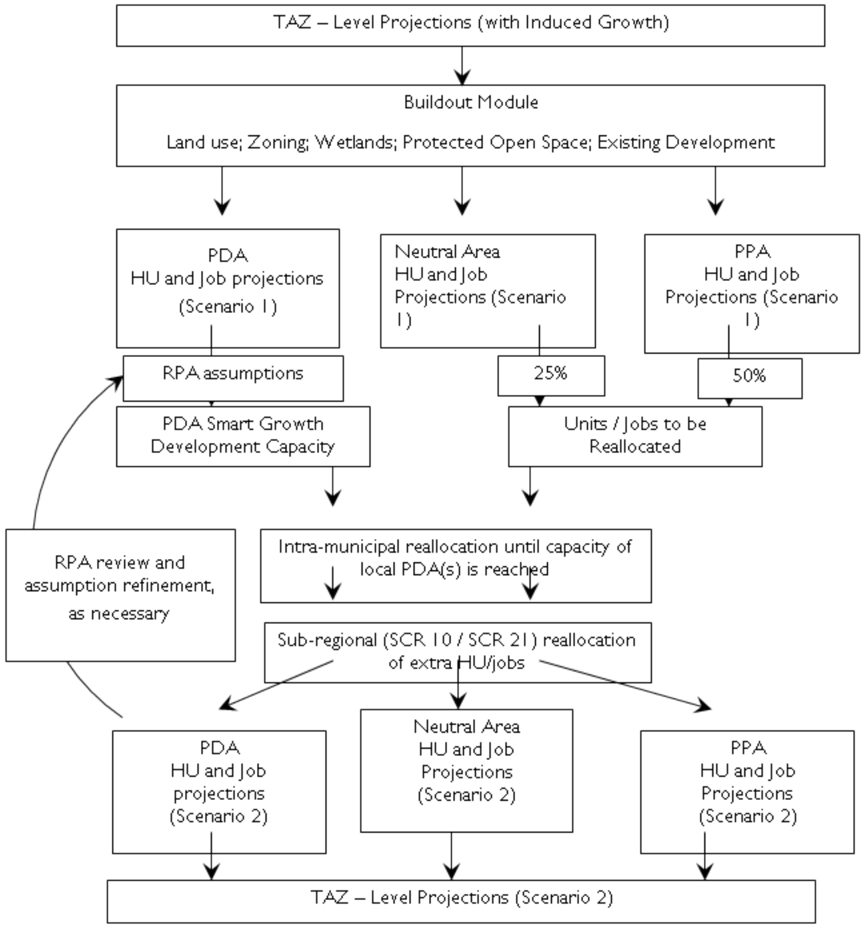


Table 5.2-2 Metrics Used to Evaluate Environmental Impacts of Induced Growth (per household)

	Metric[1]			
Resource	**Scenario 1: No Smart Growth**	**Scenario 2: Smart Growth (high scenario)**	**Scenario 2: Smart Growth (low scenario)**	**Sources**
GHG Emissions	11.83 tpy	-	11.83 tpy	eQUEST
Land Conversion[2]	0.56 acre	0.39 acre	0.44 acre	Losing Ground and American Journal of Public Health
Loss of Farmland[3]	0.13 acre	0.091 acre	0.10 acre	Losing Ground and American Journal of Public Health
Loss of Forest Land[4]	0.30 acre	0.21 acre	0.24 acre	Losing Ground and American Journal of Public Health
Loss of Wetland	7.35 sf	5.15 sf	5.81 sf	MassGIS
Biodiversity Impact	3:1 ratio	2.10:1 ratio	2.37:1 ratio	Losing Ground and American Journal of Public Health
Water Demand	162.5 gal	-	141.4 gal	MassDEP and USEPA[5]
Traffic	66 VMT/day	66 VMT/day	VMT/household/day	MPAC and MassGIS[6]

1 The number of households per community would be multiplied by this metric to estimate the potential future impacts, for each scenario.
2 These factors are averaged across the South Coast region. Community-specific factors are presented in Appendix 5.3-A.
3 These factors are averaged across the South Coast region. Community-specific factors are presented in Appendix 5.3-A.
4 These factors are averaged across the South Coast region. Community-specific factors are presented in Appendix 5.3-A.
5 U.S. Environmental Protection Agency. How to Conserve Water and Use it Effectively. http://www.epa.gov/nps/chap3.html (November 2009).
6 Conversion is based on municipality-specific factors prepared by MPAC, based on 16 million Registry of Motor Vehicles inspection records analyzed by MassGIS.

- Farmland. Future land development in the South Coast will likely involve the conversion of farmlands to residential and commercial uses. The Massachusetts Audubon Society's (MassAudubon) Losing Ground[15] study undertook an analysis of the conversion of farmland for new housing from 1999-2005 for the Commonwealth. This recent trend data provided an estimate of how much farmland might be consumed in each town as it absorbs new residential growth. A forecast was then made of the potential loss of farmland due to future development, based on development history and the size of a typical lot in each community in accordance with municipal zoning. Because similar data for relevant Rhode Island

[15] DeNormandie, J. (2009). *Losing Ground: Beyond the Footprint*. Lincoln, MA. Massachusetts Audubon Society.

communities was not readily available, an estimate of the potential loss of farmland there was made based on the experience of Massachusetts towns with similar residential densities.

- Wetlands. Residential housing development typically results in minor impacts to wetlands because of local, state, and federal legal protections. However, the construction of a subdivision might include new roadways, which could fill wetlands. In most cases, a developer would be required to mitigate the wetland loss by creating a wetland on another part of the property. To estimate the extent of wetland loss that could result from new residential growth, data were reviewed from a MassGIS analysis showing how land use changed between 1999 and 2005. Smart Growth developments, which are generally denser and feature multi-family housing, would reduce wetlands impacts. It is expected that the development of a typical housing unit would disturb 0.00017 acre of wetlands.

- Biodiversity. The potential effects of growth on biodiversity are difficult to quantify, but it is known that development destroys habitat and has a disruptive effect on ecological processes. The protection of land as open space is an important strategy. An assessment of the mixture of habitat and natural community types across a region provides insight into biodiversity. MassAudubon's Losing Ground report conducted an analysis of habitat fragmentation in USEPA ecoregions across Massachusetts. This analysis was used to estimate the direct and indirect impacts on biodiversity as a result of new development in the South Coast region. It is expected that for every 1 acre of development that 3 acres of biodiversity are impacted.

- Infrastructure. Residential housing growth will have a direct effect on communities' needs to supply or support water and wastewater infrastructure. MassDEP estimates that household water demand is approximately 65 gallons per person per day though demand does fluctuate by community. It was assumed that as new residential growth occurs, similar ratios of water and wastewater use per household will hold. Communities that rely on private wells and septic systems are not expected to bear new public costs for growth, but growth could still increase demands on constrained resources.

- Air Quality. Induced growth will result in the additional GHG emissions in the South Coast region. An analysis was conducted for a typical house constructed in the year 2035. The model provided estimated carbon dioxide emissions related a prospective home's electric and gas consumption. An analysis of the mobile source GHG emissions is presented based on a reallocation of population and employment to the TAZ level.

Assumptions for Scenario 2 (Future Growth Scenario with Smart Growth)

This scenario assumes that the measures outlined in Chapter 7 of the Corridor Plan: Implementation of the Corridor Plan are fully implemented by the state and study area municipalities. These measures have been adopted by the Development Cabinet of the administration and include implementation commitments from all Secretariats. Measures include strategic investments of discretionary state funding consistent with the Corridor Map, providing ongoing technical assistance to South Coast region municipalities to aid in changing local land use codes and regulations, creating a regional transfer of development rights (TDR) program, and capturing new tax revenues to balance state and local needs.

Strategic investments of discretionary state funding have been identified to encourage zoning and land use changes to support the Corridor Plan. Significant funding flows from the state to municipalities through a variety of grant and loan programs. By using the Corridor Plan priorities as the guide for these

investments, state agency investments will be better coordinated and will serve as an incentive that will prompt local actions consistent with the Corridor Plan. Technical assistance will be provided to expand affordable housing and economic development opportunities, open space preservation, and station area planning. A regional TDR program to steer growth into areas appropriate for development of PDAs and outside of PPAs will be created. The Commonwealth will help to support the Massachusetts Division of Fish and Wildlife's Eastern Box Turtle Conservation Plan by providing technical assistance to communities within critical areas for habitat protection. This assistance could include providing model conservation subdivision bylaws (cluster development or open space residential design bylaws) or transfer of development rights bylaws to protect critical habitat areas. Scenario 2 also includes implementing the Station Area Plans that are outlined in the Corridor Plan. TOD will cluster jobs and housing around the stations, creating new green neighborhoods. Table 5.2-3 provides a summary of build out anticipated in and around proposed transit stations.

Table 5.2-3 Station Area Development under Scenario 2

Station	Alternative	Residential (units)	Commercial (sf)
Battleship Cove	All	0	0
Dana Street	Whittenton	N/A	N/A
Easton Village	All	150-200	15,000 – 30,000
Fall River Depot	All	200	200,000
Freetown	All	200	25,000
King's Highway	All	350	250,000
North Easton	All	125	0
Raynham Place	All	400-600	90,000 – 200,000
Stoughton	All	300-350	10,000 – 25,000
Taunton	Stoughton	125-175	Complementary uses
Taunton Depot	All	150-200	0
Whale's Tooth	All	1,400	500,000

Source: Goody Clancy 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Goody Clancy: Boston, MA. June 2009.
Note: The Dana Street station as part of the Whittenton Alternatives was not envisioned at the time the Corridor Plan was prepared.

Potential impacts on environmental resources that could be attributed to induced growth under the smart growth scenario in the study area include:

- Land Use. Development that is outlined in the Corridor Plan would be considered part of the smart growth scenario. It was assumed that compact, mixed-use, and infill housing development is expected to account for approximately 30 percent of induced growth, which is expected to reduce new land development by approximately 21 percent[16] for the low scenario and 30 percent for the high scenario. It is anticipated that communities which support the development of dense multi-family, clustered single-family housing, and transit-orientated development and utilize other smart growth incentives could reduce land use impacts up to 30 percent and achieve the high scenario. The low scenario entails a sizeable improvement over traditional growth patterns, but assumes that not all communities will implement smart growth policies enumerated in the Corridor Plan.

[16] Burchell, R.W. and S. Mukherj. (2003). Conventional Development Versus Managed Growth: The Costs of Sprawl. *American Journal of Public Health*, 93 (9), 1537.

- Farmland. Under the smart growth allocation, it is estimated that 21 percent fewer acres of agricultural land would be converted for development.

- Wetlands. Smart growth development, which is generally denser and features clustered and multi-family housing, would reduce wetlands impacts by an estimated 21 percent per a previous study.

- Biodiversity. To estimate how compact development patterns would reduce impacts on biodiversity, it was assumed that a 21 percent reduction in land consumption for development would have a commensurate benefit in land to support biodiversity in the South Coast region.

- Infrastructure. Smart growth development patterns are expected to reduce the consumption of water for use outdoors. However, multi-family and clustered housing are built on smaller lots and would have smaller lawns for watering and fewer paved areas to wash. It is estimated that smart growth would reduce household water consumption by approximately 13 percent.

- Air Quality. The model provided estimated carbon dioxide emissions related a prospective home's electric and gas consumption.

5.2.2 Cumulative Impacts

This section describes the methodology used to evaluate the cumulative impacts of the South Coast Rail project.

5.2.2.1 Introduction

The South Coast Rail project is anticipated to result in direct or indirect, adverse and/or beneficial effects to a range of resources, as described in Chapter 4. Additional effects may result from induced growth, as described in the indirect effects portion of this chapter. Some of the minor or major effects of the South Coast Rail project may when combined with the effects of other past, present, or future actions result in substantive impacts to environmental or social (human) resources. These combined effects are referred to as cumulative impacts and are further discussed in this section.

5.2.2.2 Methodology

Cumulative impacts of the Build Alternatives under both Scenarios 1 and 2 were analyzed as compared to the No-Build Alternative. The evaluation was conducted for a selected set of resources within certain temporal and spatial boundaries, in reference to historical trends or affects from specific other projects, and that are (for the most part) regulated by various governmental agencies.

Resources Evaluated

Chapter 4 describes the potential direct and indirect encroachment-alteration effects of the South Coast Rail project for a broad range of resources, including environmental (e.g., air, water), ecosystems (e.g., biodiversity, wetlands), and human environment (e.g., historical and archaeological resources, economics). Some resources are expected to be little affected by the Build Alternatives; others may be substantively affected positively or negatively, either directly or indirectly. Some resources have experienced substantial historical impact from other projects or human activity, may experience substantial future impact from other projects or activities, or are of specific interest to decision-makers, regulators, and residents of the South Coast region. A cumulative impacts evaluation of certain

resources was also required by the MEPA Certificate on the ENF. The cumulative impacts evaluation focuses on air quality, biodiversity, economy, land use, protected open space, threatened and endangered species, water quality, and wetlands. Other resources evaluated in Chapter 4 did not meet the selection criteria, are expected to be little affected by the Build Alternatives, and/or do not hold specific interest to stakeholders.

Temporal and Spatial Boundaries

The cumulative impacts analysis defines a time frame and geographic range for the evaluation, and takes into account changes from other projects within this time frame that contribute to cumulative impacts on the resources listed above. Historical impacts have been evaluated for two time periods:

- For most resources, prior changes have been evaluated for the period 1990 to 2008. The year 1990 was selected as the starting date because this is a prior census year, it was in the midst of a period of economic downturn, and it establishes a reasonable baseline condition.

- Some resources have been evaluated over a longer time period where useful data are available. For example, prior impacts to wetlands have been evaluated to 1983, the year that the Massachusetts Wetlands Protection Act (WPA) regulations were established. MassAudubon has published a series of reports documenting changes in land use from 1981.

Current impacts have been evaluated based on 2008/2009 conditions, taking into consideration publication delays for the availability of the most recent data. Future impacts have been evaluated to 2035, the horizon year of the South Coast Rail project.

Spatial boundaries for the analyses varied by resource according to the specific characteristics of the resource, regulatory jurisdictions, and the availability of meaningful data.

- **Land Use**—Land use was evaluated at the local (municipal) and regional levels.

- **Air Quality**—The air quality of the South Coast region is strongly influenced by predominant winds from the southwest and west, bringing air pollutants from upwind states Connecticut, Rhode Island, and New York.[17] Based on regulatory agency jurisdictions and reporting conventions, the three counties within the South Coast Rail study area (Bristol, Norfolk, and Plymouth) are considered to constitute the airshed.

- **Biodiversity**—Biodiversity was evaluated at the ecosystem level (the Bristol Lowlands Ecoregion), considering the biotic communities present in the South Coast region but using the geographic boundaries of the 31 South Coast communities.

- **Economy**—The economy was evaluated at three levels: local (municipal), regional (South Coast Rail study area), and state.

- **Protected Open Space**—Protected open space was evaluated at the local and regional levels.

[17] DEP. 2008. *Final Massachusetts State Implementation Plan to Demonstrate Attainment of the National Ambient Air Quality Standard for Ozone*. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection: Boston.

- **Threatened and Endangered Species**—Threatened and endangered species were evaluated at the ecosystem level, but also considering the range of each identified species.
- **Water Quality**—This resource was evaluated at the watershed level.
- **Wetlands**—Wetlands were evaluated at the watershed level when useful data were available. State or regional data were used for historical perspective.

Trends and Reasonably Foreseeable Future Actions

The analysis used readily available data sources for past and future changes, including the MassAudubon *Losing Ground* report series, EEA data and publications, MassDEP wetland change mapping, federal and state agency major permit applications, and other readily available resources. For each resource, the analysis took into consideration:

- Past changes to the selected resources that resulted from development trends or major projects within the study area such as:
  - Fall River Airport closure,
  - Amtrak electrification,
  - New Bedford Wastewater Treatment Plant remediation,
  - Freetown industrial development, and
  - Great Woods development.
- Future changes to the selected resources from anticipated growth based on historic or recent trends, or specific projects, including all reasonably foreseeable projects (i.e., those that are undergoing or have completed major environmental permitting actions or MEPA and/or NEPA reviews), such as:
  - Fall River Executive Park,
  - Route 24 Exit 8A,
  - New Bedford Airport safety improvements,
  - Mashpee Wampanoag Casino, and
  - Other proposed developments.

Regional transportation planning was taken into consideration to the greatest extent possible. The most current regional plan covers the period from 2013 to 2016, and is mostly composed of road and bridge resurfacing and reconditioning projects.[18]

[18] Southeastern Massachusetts Metropolitan Planning Organization. 2009. *FFY 2013-2016 Transportation Improvement Program*. Prepared by the Southeastern Regional Planning and Economic Development District: Taunton, MA.

None of the projects in the plan include new road construction. Although several are identified as congestion relief projects, and specifically reference air quality improvements, quantified impacts to the resources evaluated in this cumulative impacts analysis are not provided. Some projects, identified as "congressional earmarks waiting for project approval and full funding" are also listed, and include projects such as Route 79 Improvements in Fall River and highway interchange and freight rail improvements throughout the South Coast region. It also identifies the relocation of Route 79 in Fall River to create a 4-land urban boulevard with a landscaped median and improved access to developable areas along the waterfront. Similar improvements are identified for Route 18 in New Bedford. Potential impacts associated with these projects are incorporated in the general resource trends described in the cumulative impact assessment.

Although not a "reasonably foreseeable future action" in the traditional sense of cumulative impacts analysis, the possible effects of climate change on resources such as biodiversity, threatened and endangered species, and wetlands has been taken into consideration to the extent possible.

The cumulative impacts evaluation analyzes the past and future changes to the selected resources from development trends and other specific projects within the resource-specific study areas, together with the added impacts of the South Coast Rail alternatives for each alternative and for the two scenarios.

Federal, state, or local governmental agencies regulate most of the resources evaluated for cumulative impacts. The regulatory programs drive many of the trends for improving resource values (e.g., air quality, water quality, and wetlands area) and are therefore important in determining resource impacts of the South Coast Rail and other regional projects. Regulatory programs typically prohibit impacts except as authorized by a permit, are charged with reviewing permit applications, and, generally, only authorize activities that provide the least impact to the resource while still meeting the proposed project's purpose and need. For this cumulative impacts evaluation, existing permitted facilities and proposed actions indicate the current and likely future impacts to the resources.

The agencies responsible for administering these programs are typically charged with managing the resources on a project-by-project basis but in the context of the common good. For example, the federal government has a "no net loss" policy on wetlands; project proponents seeking permits to fill wetland areas are commonly required to offset losses by replacing filled wetlands at a negotiated ratio, such as 2:1 or 3:1. These replacement ratios recognize the inherent unpredictability in creating or restoring replacement wetlands that offset the wetland functions from the project-specific loss, as well as the necessary passage of time between establishing adequate wetland hydrology, and succession to vegetative stability and ultimately functional maturity. This passage of time is particularly lengthy for forested wetlands. Thus, certain regulated resources can experience improvements, rather than degradations, over time.

5.3 DESCRIPTION OF IMPACT SCENARIOS

This section describes the three scenarios evaluated in this chapter: the No-Build Alternative and Scenarios 1 and 2 under the Build Alternatives. Tables 5.3-1 and 5.3-2 present the results of the allocation of induced households and jobs to the municipal level. These results are presented in Figures 5-3 through 5-7. This model was created as part of a theoretical exercise to demonstrate how development patterns could be shifted if the Commonwealth and local municipalities work together to further the goals of the Corridor Plan, in conjunction with local support in the form of zoning and permitting changes.

5.3.1 No-Build (Enhanced Bus) Alternative

This alternative assumes that growth in the South Coast region by 2035 occurs as projected by the three RPAs. These growth projections were developed in 2010 and are based on U.S. Census Bureau data, state requirements, economic trends, and local circumstances. The No-Build Alternative projects that the study area would gain 75,212 households by 2035, with the largest increases in Fall River (7,236), New Bedford (5,290), and Taunton (5,062). The smallest amount of household growth is projected for Marion (285) and Somerset (678).

Under the No-Build Alternative, significant job growth would be experienced throughout the South Coast region and is projected to be greatest in Dartmouth (5,191), Foxborough (4,558), Taunton (4,153), and Canton (3,369), among numerous others that are anticipated to increase their employment base by between 1,800 and 3,340 (Table 5.3-2). However, some municipalities are projected to experience a decrease in their employment base, most significantly in Attleboro (-2,751) and Fall River (-1,518). Overall, municipalities in the South Coast region are projected to add 37,864 new jobs by 2035.

5.3.2 Scenario 1 (Future Growth Scenario without Smart Growth)

Scenario 1 considers baseline growth of the No-Build Alternative plus induced growth from the Build Alternatives. It assumes that no additional smart growth measures would be implemented other than those already incorporated into municipal zoning or state planning.

Residential growth that would be introduced to the South Coast region as a result of the Build Alternatives under Scenario 1 is projected to total 2,804 households. The vast majority of these new households would be located in just a few municipalities: Fall River (533); New Bedford (449); Fairhaven (361); and Westport (205). All other municipalities in the South Coast region are projected to increase by less than 120 households with four communities anticipated to introduce fewer than 10 new households over the No-Build Alternative (Table 5.3-1).

Under Scenario 1, the Build Alternatives are projected to introduce or help retain 1,341 jobs in the South Coast region (Table 5.3-2). Some municipalities such as Attleboro, Fall River, and Fairhaven are projected to decrease their employment base by 2035 over the No-Build Alternative. However, under Scenario 1 of the Build Alternatives, it has been projected that approximately 257 jobs would be retained over the No-Build Alternative. Easton, New Bedford, and Taunton are projected to introduce an additional 137 to 147 new jobs under Scenario 1 of the Build Alternatives over the No-Build Alternative by 2035. The majority of municipalities in the South Coast region are projected to experience a change of less than 40 jobs over the No-Build Alternative.

5.3.3 Scenario 2 (Future Growth Scenario with Smart Growth)

Under Scenario 2, the distribution of the growth (induced and baseline) would shift to be concentrated in the PDAs. Induced growth would be concentrated around Foxborough (749), Fall River (393), New Bedford (334), and Bridgewater (265). Foxborough, Bridgewater, and Attleboro are projected to experience significant growth over the No-Build Alternative and Scenario 1 (Table 5.3-1). The Smart Growth scenario would shift growth (induced and baseline) out of rural communities and ten South Coast region municipalities are projected to experience negative household growth under Scenario 2 of the Build Alternatives. The most significant decline is projected for Westport with a decrease of 230 households by 2035. In total, projections indicate an increase of 2,802 households over the No-Build Alternative, slightly less than under Scenario 1.

Table 5.3-1 Projected Total Household Growth by Community (2035)

		Stoughton and Whittenton Alternatives			
		Scenario 1		Scenario 2	
Municipality	No-Build Alternative	Total Growth	Change from No-Build	Total Growth	Change from No-Build
Acushnet	965	992	27	1,006	41
Attleboro	2,906	2,920	14	3,108	202
Berkley	806	837	31	797	-9
Bridgewater	1,730	1,760	30	1,995	265
Canton	2,648	2,662	14	2,728	80
Dartmouth	3,705	3,772	67	3,717	12
Dighton	992	1,056	64	969	-23
Easton	1,262	1,287	25	1,406	144
Fairhaven	1,522	1,883	361	1,597	75
Fall River	7,236	7,769	533	7,629	393
Foxborough	1,515	1,524	9	2,264	749
Freetown	935	994	59	930	-5
Lakeville	1,433	1,462	29	1,378	-55
Mansfield	2,184	2,191	7	2,205	21
Marion	285	298	13	312	27
Mattapoisett	732	785	53	735	3
Middleborough	2,912	2,938	26	2,972	60
New Bedford	5,290	5,739	449	5,624	334
North	3,753	3,772	19	3,864	111
Norton	1,646	1,674	28	1,631	-15
Raynham	2,318	2,406	88	2,291	-27
Rehoboth	2,069	2,107	38	2,046	-23
Rochester	994	1,022	28	956	-38
Seekonk	1,302	1,315	13	1,330	28
Sharon	1,027	1,033	6	1,104	77
Somerset	678	714	36	718	40
Stoughton	2,267	2,339	72	2,423	156
Swansea	1,377	1,417	40	1,382	5
Taunton	5,062	5,177	115	5,214	152
Wareham	3,044	3,096	52	3,043	-1
Westport	3,419	3,624	205	3,189	-230
Bristol, RI	1,943	1,999	56	1,999	56
Portsmouth, RI	2,386	2,455	69	2,455	69
Tiverton, RI	1,976	2,095	119	2,095	119
Warren, RI	893	902	9	902	9
Total	75,212	78,016	2,804	78,014	2,802

Source: MAPC, OCPC, SRPEDD.

Projections indicate that approximately 1,339 new jobs would be introduced to South Coast region municipalities under Scenario 2. The vast majority of induced growth job would be concentrated in Foxborough which is projected to increase its employment base by 1,134 over the No-Build Alternative and 1,074 over Scenario 1 of the Build Alternatives. More than half of South Coast region municipalities are projected to lose some of their employment base by 2035 over the No-Build Alternative. However, projections indicate a decrease of between 15 and 113 jobs (Table 5.3-2).

5.3.4 Indirect Effects

This section describes potential environmental impacts that may result under the No-Build and Build Alternatives. This analysis presents a hypothetical comparison of the potential impacts and benefits of the South Coast Rail project. The metrics identified in this section are not anticipated to be exact predictions of indirect effects, but are intended to enable informed comparison and contrast between and among project alternatives.

Potential impacts are relatively similar under the No-Build Alternative and Scenario 1 of the Build Alternatives. Both generally assume that development would continue in a fashion similar to existing conditions and/or in accordance with municipal goals. However, smart growth measures would not be implemented. The low and high scenarios of Scenario 2 under the Build Alternatives assume that a certain amount of smart growth would be implemented to help contain sprawl and impacts to natural resources. Under the low and high scenarios, potential adverse environmental impacts from land development would be less than under the No-Build Alternative or Scenario 1.

Table 5.3-2 Projected Total Job Growth by Community (2035)

		Stoughton and Whittenton Alternatives			
		Scenario 1		Scenario 2	
Municipality	No-Build Alternative	Total Growth	Change from No-Build	Total Growth	Change from No-Build
Acushnet	-516	-505	11	-543	-27
Attleboro	-2,751	-2,704	47	-2,733	18
Berkley	173	182	9	142	-31
Bridgewater	1,829	1,851	22	2,128	299
Canton	3,369	3,413	44	3,406	37
Dartmouth	5,191	5,291	100	5,125	-66
Dighton	-45	-42	3	-79	-34
Easton	1,468	1,615	147	1,911	443
Fairhaven	-594	-578	16	-606	-12
Fall River	-1,518	-1,324	194	-1,482	36
Foxborough	4,558	4,618	60	5,692	1,134
Freetown	2,978	3,025	47	2,865	-113
Lakeville	990	1,007	17	923	-67
Mansfield	706	710	4	708	2
Marion	270	276	6	235	-35
Mattapoisett	97	99	2	64	-33
Middleborough	2,500	2,525	25	2,480	-20
New Bedford	1,261	1,402	141	1,311	50
North Attleborough	298	299	1	310	12
Norton	850	855	5	803	-47
Raynham	3,095	3,170	75	3,067	-28
Rehoboth	362	373	11	333	-29
Rochester	-151	-149	2	-180	-29
Seekonk	1,191	1,206	15	1,197	6
Sharon	134	137	3	119	-15
Somerset	708	743	35	682	-26
Stoughton	842	872	30	855	13
Swansea	601	612	11	565	-36
Taunton	4,153	4,290	137	4,154	1
Wareham	3,339	3,401	62	3,266	-73
Westport	451	473	22	423	-28
Bristol, RI	640	652	12	652	12
Portsmouth, RI	902	919	17	919	17
Tiverton, RI	249	254	5	254	5
Warren, RI	235	238	3	238	3
Total	37,865	39,206	1,341	39,204	1,339

Source: MAPC, OCPC, SRPEDD.

5.3.4.1 Land Use

Future development is anticipated to convert undeveloped land to developed areas, including residential, retail, commercial and industrial uses. This analysis evaluates the loss of undeveloped land that would occur by 2035 based on the projected increase in households, using the metrics identified in Table 5.2-2. Commercial, retail, and other land use types are not considered in the analysis. Table 5.3-3 presents the total number of acres that would be developed under the No-Build and Build Alternatives. Appendix 5.3-A identifies land use impacts in study area municipalities under the No-Build and Build Alternatives.

Table 5.3-3 Land Use Impacts by 2035 (Acres of Loss)

Alternative	Scenario 1	Scenario 2 (low)	Scenario 2 (high)
No-Build	38,892	38,892	38,892
Stoughton and Whittenton	40,184	31,631	27,995
Change from No-Build	+1,292	-7,261	-10,897

Municipalities across the South Coast region have different zoning regulations in place that dictate the density of future development. For example, Lakeville zoning regulations require an average of 1.23 acres per household while Canton requires only 0.14 acre per household. As a result, municipalities that are projected to increase the most significantly may require less land than municipalities where less development is anticipated. The low and high scenarios under Scenario 2 assume that growth would be concentrated around station areas and central business districts to support smart growth principles.

No-Build Alternative

The No-Build Alternative is anticipated to result in the loss of 38,892 acres of land for new residential development. The largest losses would occur in Westport (2,325), Taunton (2,278), Middleborough (2,184), and Dartmouth (2,119) while the smallest losses would occur in Marion (168), Somerset (271), and Canton (371). Twelve of the 35 municipalities in the study area would require between 1,000 and 2,000 acres to support projected residential development under the No-Build Alternative.

Scenario 1

Projected residential development under Scenario 1 is projected to require an additional 1,292 acres over the No-Build Alternative for a total of 40,184 acres. Similar to the No-Build Alternative, a significant share of the necessary land would be located in Dartmouth, Middleborough, Taunton, and Westport. Other municipalities that would now require more than 2,000 acres to support projected development under Scenario 1 but not the No-Build Alternative include Portsmouth, RI (2,038) and Rehoboth (2,023). Nineteen municipalities in the study area would require less than 1,000 acres to support projected residential development by 2035. Marion and Somerset would both require less than 300 acres to support projected residential growth.

Scenario 2

Under the low scenario, approximately 31,631 acres would be required to support projected residential development by 2035, a decrease of 7,261 acres over the No-Build Alternative. Twenty-three study area municipalities would require less than 1,000 acres to support projected residential growth. The six

municipalities that would require more than 2,000 acres to support projected residential development under the No-Build Alternative and Scenario 1 would require less than 2,000 acres under the low scenario of Scenario 2.

A total of 25 study area municipalities would require less than 1,000 acres to support projected residential development should smart growth measures be implemented to their fullest. A total of 27,995 acres would be needed to support projected residential development in 2035, a decrease of almost 11,000 acres from the No-Build Alternative and 3,636 acres from the low scenario of Scenario 2.

5.3.4.2 Forest Land

Forest land forms a major element of the South Coast region landscape and provides species habitat, recreation opportunities, and environmental benefits such as carbon sequestration. Forest land, unless protected by restrictions, is particularly vulnerable to development. Table 5.3-4 provides a summary of the total anticipated conversion of forest land to developed land by 2035 in the South Coast study area municipalities to help support projected residential development.

Land area that would be developed under the No-Build Alternative and Scenario 1 of the Build Alternatives assumes that current zoning regulations would continue without the implementation of smart growth measures. As a result, more forest land would need to be developed to help support projected residential growth than would be necessary under Scenario 2 which focuses on concentrated development based on smart growth principles. Appendix 5.3-A identifies forest land impacts in study area municipalities under the No-Build and Build Alternatives.

Table 5.3-4 Forest Land Impacts by 2035 (Acres of Loss)

Alternative	Scenario 1	Scenario 2 (low)	Scenario 2 (high)
No-Build	**19,965**	**19,965**	**19,965**
Stoughton and Whittenton	**20,584**	**16,169**	**14,403**
Change from No-Build	**619**	**-3,796**	**-5,562**

No-Build Alternative

The No-Build Alternative is anticipated to result in the loss of 19,965 acres of forest land to support projected residential development in study area municipalities. Four municipalities would experience a loss of more than 1,000 acres of forest land: Taunton (1,367); Middleborough (1,252); Dartmouth (1,074); and Westport (1,060). All other study area municipalities would require less than 900 acres of forest land to be converted to support projected residential development by 2035. The least amount of forest land to be converted for residential use would be in Marion (134) and Somerset (81).

Scenario 1

Under Scenario 1, approximately 20,584 acres of forest land would be converted to support projected residential development across study area municipalities, 619 more acres than under the No-Build Alternative. The same four municipalities as identified in the No-Build Alternative would require the conversion of more than 1,000 acres to support projected residential development in 2035. Fourteen study area municipalities would require the conversion of less than 500 acres of forest land to support projected residential development. Somerset and Canton would both require less than 200 acres of forest land.

Scenario 2

Under the low scenario, approximately 16,169 acres of forest land would be converted to support projected residential development across study area municipalities, a decrease of 4,415 acres over Scenario 1 and 3,796 acres over the No-Build Alternative. Only two municipalities would require the conversion of more than 1,000 acres of forest land to support projected residential development: Middleborough (1,010) and Taunton (1,095). Nine study area municipalities would require the conversion of less than 300 acres of forest land to support projected residential development.

Under the high scenario, no study area municipalities would require the conversion of more than 1,000 acres of forest land to support projected residential development by 2035. Eleven study area municipalities would experience the conversion of less than 300 acres to support such development, two more municipalities than under the low scenario. Under this scenario, which assumes that smart growth principles would be implemented to the greatest extent possible, approximately 5,562 acres less than under the No-Build Alternative and 6,181 acres less than under Scenario 1 of forest land would be converted to support projected residential development across the South Coast region.

5.3.4.3 Farmland

Farmland is a specific land use type that is of concern in the predominantly rural, agricultural communities of the South Coast region. Land that is held for farmland purposes provides economic benefits and a certain quality of life for people involved in farming activities. Farmland, unless protected by restrictions, is particularly vulnerable to development. Table 5.3-5 provides a summary of the total anticipated conversion of farmland to developed land by 2035 in study area municipalities to help support projected residential development. Appendix 5.3-A identifies farmland impacts in study area municipalities under the No-Build Alternative as well as Scenarios 1 and 2 of the Build Alternatives.

Table 5.3-5 Farmland Impacts by 2035 (Acres of Loss)

Alternative	Scenario 1	Scenario 2 (low)	Scenario 2 (high)
No-Build	9,907	9,907	9,907
Stoughton & Whittenton	10,249	7,903	7,142
Change from No-Build	342	-2,004	-2,765

No-Build Alternative

The No-Build Alternative is anticipated to result in the loss of 9,907 acres of farmland for new residential development. The largest losses would occur in Westport (1,060), Rehoboth (745), Middleborough (670), Portsmouth, RI (668), and Dartmouth (667). Twelve study area municipalities would experience the loss of less than 100 acres of farmland to support projected residential development.

Scenario 1

The loss farmland across the South Coast region to support projected residential development in 2035 under Scenario 1 would be similar to that experienced under the No-Build Alternative. Under the "business as usual" scenario, an additional 342 acres of farmland over the No-Build Alternative would be necessary to support projected residential development.

Scenario 2

Under the low scenario, approximately 2,000 fewer farmland acres would be converted to support projected residential development by 2035 than under the No-Build Alternative. A total of approximately 7,903 farmland acres would be converted for residential use. Twelve study area municipalities would require the conversion of less than 100 farmland acres to support this development. Land conversion in seven municipalities would represent the vast majority of converted farmland; four of which are located in Rhode Island.

Of all project alternatives, the high scenario would require the least amount of farmland to support projected residential development. Should smart growth measures be implemented to the greatest extent possible, as identified in the Corridor Plan, approximately 7,142 farmland acres would be converted to support projected residential growth. This is approximately 761 and 3,107 fewer farmland acres than under the low scenario and Scenario 1.

5.3.4.4 Wetlands

Although wetlands are stringently protected under local, state, and federal laws and regulations, these programs allow wetlands to be altered under certain circumstances, if proponents comply with relevant performance standards. Generally, small losses of wetlands are permissible if there are no practicable alternatives and compensatory mitigation is provided. This analysis assumes that there would be, on average, a small amount of direct wetland alteration for each new household; indirect impacts to wetlands that result from development and could possibly degrade their functions and values were not estimated.

USACE and USEPA have a policy of “no net loss” of wetland functions and values. Accordingly, this analysis assumes that projected wetland losses would be permittable and unavoidable consequences of secondary developments resulting from the South Coast Rail project, and that compensatory mitigation would be required and implemented to offset those wetland losses.

Table 5.3-6 provides a summary of the total anticipated loss of wetlands as a result of residential development by 2035. Appendix 5.3-A identifies wetland impacts in study area municipalities under the No-Build and Build Alternatives.

Table 5.3-6 Direct Wetland Impacts by 2035 (Acres of Loss)

Alternative	Scenario 1	Scenario 2 (low)	Scenario 2 (high)
No-Build	12.8	12.8	12.8
Stoughton and Whittenton	13.3	10.1	9.4
Change from No-Build	0.5	-2.7	-3.4

No-Build Alternative

The No-Build Alternative is anticipated to result in the loss of 12.8 wetlands acres to support new residential development. Only Fall River would experience the loss of more than one wetland acre. Twenty-eight study area municipalities are anticipated to lose 0.50 acre or less of wetland acres to support projected residential development by 2035.

Scenario 1

Under Scenario 1, an additional 0.50 wetland acre would be necessary to help support projected residential development over the No-Build Alternative. Because of the number of municipalities in the study area and small change from the No-Build to Scenario 1 of the Build Alternatives in terms of the acreage of wetlands necessary, the typical increase is significantly less than 0.1 acre. An additional 0.9 acre would be necessary to support projected residential development in Fall River by 2035.

Scenario 2

The low scenario would require approximately 2.7 fewer wetland acres to support projected residential development by 2035 than the No-Build Alternative. The implementation of smart growth measures would reduce wetland impacts by approximately 3.2 acres over Scenario 1, where development would continue as under existing conditions. Wetland impacts in Fall River would be less than 1 acre under the low scenario and required acreage would also decrease in all other study area municipalities.

Should smart growth measures be implemented to the fullest extent possible as identified in the Corridor Plan, wetland impacts would decrease to 9.4 acres, approximately 3.4 acres and 3.9 acres less than under the No-Build Alternative and low scenario, respectively. Many study area municipalities would experience less than 0.2 acre of wetland impacts should residential development be concentrated in PDAs and away from PPAs.

5.3.4.5 Biodiversity

New development is anticipated to result in the loss of biological diversity within the South Coast region by reducing the abundance of plants and animals. Development may affect plants and animals in both terrestrial and aquatic habitats through the direct loss of habitat, the creation of barriers to the movement of organisms, the reduction of habitat quality, and the reduction in the size of available habitats. The net results of these changes may reduce the size of populations, eliminate some populations, or potentially eliminate some species. These effects are directly correlated with the loss of natural undeveloped land, but also a result of new infrastructure (roads, utilities) required to support new development.

Table 5.3-7 provides a summary of the total biodiversity impacts anticipated by 2035 under each project alternative. Appendix 5.3-A identifies biodiversity impacts in study area municipalities under the No-Build and Build Alternatives.

Table 5.3-7 Biodiversity Impacts by 2035 (Acres with Decreased Value)

Alternative	Scenario 1	Scenario 2 (low)	Scenario 2 (high)
No-Build	116,675	116,675	116,675
Stoughton and Whittenton	120,551	74,967	58,706
Change from No-Build	3,876	-41,708	-57,969

No-Build Alternative

The No-Build Alternative is anticipated to affect biodiversity according to a 3:1 ratio. For every 1 acre of undeveloped land that is converted for development, there will be an impact on the biodiversity of an

additional 3 acres of land.[19] The greatest impacts on biodiversity would occur in communities where there is projected to be large amounts of new residential development. The No-Build Alternative would reduce the biodiversity value of an estimated 116,675 acres of land within the study area. Only Marion and Somerset are anticipated to have impacts that are less than 1,000 acres. Should residential development occur as projected, six municipalities would experience biodiversity impacts of between 5,900 and 7,000 acres: Dartmouth; Middleborough; Rehoboth; Taunton; Westport; and Portsmouth, Rhode Island.

Scenario 1

Under Scenario 1, the ratio of biodiversity impacts are anticipated to be the same as under the No-Build Alternative. Biodiversity impacts under Scenario 1 would increase by almost 4,000 acres than under the No-Build Alternative. Should residential development occur as anticipated, approximately 120,551 acres would experience biodiversity impacts.

Scenario 2

The low scenario assumes that the biodiversity impact ratio would decrease to 2.37:1 from the 3:1 ratio under the No-Build Alternative and Scenario 1 of the Build Alternatives. Under the low scenario, the implementation of smart growth measures would decrease biodiversity impacts by almost 42,000 acres over the No-Build Alternative. All study area municipalities would experience biodiversity impacts of less than 4,500 acres, a significant decrease than under the No-Build Alternative and Scenario 1. Six municipalities would experience biodiversity impacts of less than 1,000 acres, three of which are located closer to Boston and already experience significant development.

Assuming that smart growth measures are implemented to the greatest extent possible as identified in the Corridor Plan, the biodiversity impact ratio would decrease to 2.10:1. As a result, total biodiversity impacts would decrease even further than under the low scenario. Under the high scenario, approximately 58,706 acres would experience biodiversity impacts by 2035. This is slightly less than 58,000 acres less than under the No-Build Alternative. The high scenario would impact slightly less than 16,000 acres than under the low scenario. Significant reductions in biodiversity impacts would occur in municipalities where PDAs exist and/or TOD plans or other smart growth measures are in place or anticipated, such as Taunton, Stoughton, Rehoboth, Westport, and Portsmouth, Rhode Island.

5.3.4.6 Infrastructure

New development would place increased demand on municipal infrastructure, particularly water and sewer services. This section evaluates the increase demand for water resulting from projected residential growth in the South Coast region. Many study area municipalities rely on groundwater sources and impose water restrictions under most summer conditions due to limited supply. As a result, new development has the potential to place significant demand on water resources if appropriate measures are not put in place. Table 5.3-8 provides a summary of the change in water demand anticipated by 2035 under the No-Build and Build Alternatives.

[19] DeNormandie, J. (2009). *Losing Ground: Beyond the Footprint*. Lincoln, MA. Massachusetts Audubon Society.

Table 5.3-8 Water Demand by 2035 (Gallons per Household)

Alternative	Scenario 1	Scenario 2*
No-Build	12,221,993	12,221,993
Stoughton and Whittenton	12,677,600	11,029,902
Change from No-Build	455,607	-1,192,091

Note: Assumes that water demand will be almost the same under the low and high scenarios because the difference between the two is only two households.

No-Build Alternative

The No-Build Alternative is anticipated to continue current patterns of household water use. It assumes the current trend of 65 gallons per person per day would continue. Assuming there are 2.5 people per household, the average household's water consumption would be approximately 162.5 gallons per day (gpd). Should development continue as projected, water consumption under the No-Build Alternative is anticipated to total approximately 12,221,993 gpd by 2035. The more significant impacts on water demand will be borne by communities projected to increase notably over the next 20 years. New residential development is projected to be greatest in Fall River, New Bedford, and Taunton, therefore these communities would place the largest increased demand on water resources.

Scenario 1

Scenario 1 assumes the same water consumption patterns as under the No-Build Alternative. As a result, increased household development that is projected as a result of the Build Alternatives would place additional demand on water resources. The introduction of an additional 2,804 households would increase water demand by approximately 455,600 gpd over the No-Build Alternative by 2035.

Scenario 2

Under Scenario 2, smart growth measures for small lots, clustered single-family housing, or multifamily housing developments would have beneficial effects on water demand because there would be smaller lawns to water and fewer paved surfaces to keep clean. It is estimated that the average household's water consumption under this scenario would be approximately 141.4 gpd. Water demand under this scenario is anticipated to decrease by approximately 1,192,091 gpd and 1,647,698 gpd over Scenario 1 of the Build Alternatives and the No-Build Alternative, respectively. This represents a decrease of 13.0 percent and 9.9 percent.

5.3.4.7 Traffic

Future regional growth is anticipated to result in increased VMT. CTPS conducted regional travel demand modeling using the No-Build and Build Alternatives as inputs to the model. The model, which is based on the traditional four-step urban transportation planning process, uses 2010 as the base year and examines travel patterns on an average weekday for four time periods. It takes into consideration data on service frequency, routing, travel time, transit parking availability, and fares of all transit services as well as connectivity, length, speed, capacity, and tolls, among others associated with the roadway network. Traffic forecasts were then prepared based on the population and employment projections under the No-Build and Build Alternatives as presented in Tables 5.3-1 and 5.3-2. Table 5.3-9 provides a summary of the projected increase in vehicle miles and hours traveled under the No-Build and Build Alternatives in 2035.

Table 5.3-9 Vehicle Miles and Hours Traveled by 2035 (per day)

	Vehicle Miles Travelled (VMT)		Vehicle Hours Travelled (VHT)	
Alternative	Total	Difference from No-Build	Total	Difference from No-Build
No-Build	118,894,000		3,956,500	
Stoughton Electric	118,641,800	-252,200	3,944,200	-12,300
Whittenton Electric	118,696,500	-197,500	3,947,300	-9,200
Stoughton Diesel	118,654,800	-239,200	3,944,700	-11,800
Whittenton Diesel	118,708,500	-185,500	3,947,700	-8,800

No-Build Alternative

Under the No-Build Alternative, the South Coast region would experience substantial population and employment growth. This growth would result in increased VMT and VHT. Daily VMT in the region is projected to total approximately 11.89 million while daily VHT would increase to just under 4 million hours.

Stoughton Alternative

Under the Stoughton Electric Alternative, daily VMT would decrease by approximately 252,200 and 54,700 over the No-Build and Whittenton Alternatives, respectively. The Stoughton Electric Alternative would also reduce VHT the most significantly of the project alternatives. The model estimates that approximately 12,300 hours would be saved daily over the No-Build Alternative. Daily VHT would total approximately 3.94 million hours. Stoughton Diesel effects on traffic would be slightly less than Stoughton Electric (239,200 reduction in VMT and 11,800 reduction in VHT).

Whittenton Alternative

The Whittenton Electric Alternative would result in fewer VMT and VHT than the No-Build Alternative but not result in savings as significant as under the Stoughton Electric Alternative. A daily reduction of approximately 197,500 VMT would result from the operation of the Whittenton Electric Alternative over the No-Build Alternative. Daily VHT savings would be approximately 9,200 less than the No-Build Alternative, 3,100 fewer hours than under the Stoughton Electric Alternative. The model identifies longer travel times from New Bedford and Fall River up through Taunton as a cause of reduced demand at these stations. Vehicle miles may also increase as a result of people willing to bypass the slower segment of the Whittenton Alternative in Taunton in order to pick up the train north of the delay during the morning peak inbound commute period.

Whittenton Diesel effects on traffic would be slightly less than Whittenton Electric (185,500 reduction in VMT and 8,800 reduction in VHT).

5.3.4.8 Greenhouse Gas Emissions

Future regional growth is anticipated to result in increased emissions of regulated air quality pollutants from mobile and stationary sources, as well as increased GHG emissions (primarily CO_2). This analysis evaluates GHG emissions based on an average emission factor of 11.83 tons per year (tpy) per household and change in VMT.

GHG Emissions by Household

Although dispersed residential development under Scenario 1 can be contrasted with more compact, clustered development patterns anticipated under Scenario 2, emission factors specifically applicable to smart growth-style development were not available. This analysis therefore compares GHG emissions that may be expected from overall household growth, with the general assumption that there would be lower GHG emissions under Scenario 2 than under Scenario 1.

Regional GHG emissions would increase and reduced sequestration capacities would be experienced as undeveloped forests are cleared to accommodate new residential development with and without the South Coast Rail project. Various studies have attempted to quantify the role of forests in helping to sequester carbon from the atmosphere, but the analysis is complex and depends on multiple variables, many of which are poorly understood. The carbon sequestration capacity of individual tree species, the age of forests, the volume of trees cut down, and soil disturbance are a few examples of multiple factors that would affect carbon emissions in a certain area. Because it is very complex and not well understood, quantitative analysis of carbon sequestration was not undertaken for the South Coast Rail alternatives.

This analysis evaluates the increase in GHG emissions from residential sources that would occur by 2035 based on the anticipated increase in households, using the metrics identified in Table 5.1-2. A summary of this information is presented in Table 5.3-10 and described in greater detail in Appendix 5.3-A.

Table 5.3-10 Greenhouse Gas Emissions from Residential Development by 2035[1]

Alternative	Scenario 1	Scenario 2
No-Build	889,761	n/a
Stoughton and Whittenton	922,929	<922,929
Change from No-Build	33,168	<33,168

1 (CO_2 tons/year)

No-Build Alternative

For stationary sources of GHG emissions, current patterns of residential housing construction are expected to continue under the No-Build Alternative. Using the eQUEST model on a typical 2,000-square-foot (sf) house, estimated household GHG emissions are approximately 11.83 tpy. The No-Build Alternative is anticipated to result in an increase of 889,761 tpy of GHG emissions between 2000 and 2035. The projected increase in residential development in in Fall River, New Bedford, and Taunton would result in those communities having the greatest stationary source GHG emissions.

Scenario 1

Under Scenario 1, the Stoughton and Whittenton Alternatives are anticipated to indirectly result in an increase of 33,168 tpy in stationary source GHG emissions by 2035 over the No-Build Alternative, an increase of 4 percent. The largest GHG emissions would occur in Fall River, New Bedford, and Taunton.

Scenario 2

To estimate the change in stationary source GHG emissions from residential development, the eQUEST model was given an input of a prospective 1,500 sf home, one that might be found in a small lot or

multifamily housing development that is more likely to be introduced to study area municipalities should smart growth measures be in place. The model calculated the household GHG emissions to remain at 11.83 tpy despite the reduction in house size. As a result, the total stationary source GHG emissions are same for both scenarios.

GHG Emissions by VMT

This section provides an overview of estimated CO_2 emissions in 2035 that would result under each alternative from the change in VMT. Unlike the stationary source emission analysis above, this information is presented by alternative and for Scenario 1 only. As demonstrated in Table 5.3-11, the Stoughton Electric Alternative would result in the greatest reduction in CO_2 emissions over the No-Build Alternative. The operation of this alternative would result in the decrease of approximately 52,425 tons of CO_2 annually. The Whittenton Electric Alternative would result in a decrease of approximately 41,055 tons of CO_2 in comparison to the No-Build Alternative. The Stoughton Diesel Alternative would result in greater CO_2 reductions than the Whittenton Electric Alternative, but slightly less than the Stoughton Electric Alternative. The Whittenton Diesel would have the smallest effect on CO_2 emissions from automobile travel under Scenario 1. Although not quantified, the regional VMT and CO_2 emissions under Scenario 2 would be slightly less than the numbers presented for Scenario 1 (see discussion below for further assessment of Scenario 2).

Table 5.3-11 Greenhouse Gas Emissions from Regional Vehicle Miles Travelled by 2035, Scenario 1

	Vehicle Miles Travelled (VMT) (daily)		Carbon Dioxide (CO_2) tons/year	
Alternative	Total	Difference from No-Build	Total	Difference from No-Build
No-Build	118,894,000		24,714,942	
Stoughton Electric	118,641,800	-252,200	24,662,517	-52,425
Whittenton Electric	118,696,500	-197,500	24,673,887	-41,055
Stoughton Diesel	118,654,800	-239,200	24,665,218	-49,724
Whittenton Diesel	118,708,500	-185,500	24,676,380	-38,562

Note: VMT is anticipated to be slightly less under Scenario 2. Numbers reflect auto VMT only.

To provide some basis for comparing the effects of Scenario 1 and Scenario 2, a separate VMT analysis was conducted for the South Coast Rail communities (the regional model analysis includes most of eastern Massachusetts). The analysis used conversion factors (VMT per household per day) unique to each municipality based on projected increases in households. These municipality-specific factors were prepared by MAPC based on an analysis of 16 million Registry of Motor Vehicles inspection records. The per household VMT for each community included in this analysis includes local trips (schools, shopping, and jobs) rather than the long-distance commuting VMT that is evaluated in the regional assessment of the direct transportation effects of each alternative. Table 5.3-12 summarizes the results, with detailed tables with results for each community provided in Appendix 5.3-A.

Under the No-Build Alternative, the South Coast region would experience population growth and corresponding increases in VMT of 4,961,201 per day by 2035. The largest increases are expected in Fall River, Taunton, and Westport.

Table 5.3-12 Greenhouse Gas Emissions Increase from VMT in South Coast Rail Communities[1]

Alternative	Scenario 1	Scenario 2
No-Build	4,961,201	N/A
Stoughton and Whittenton	5,123,749	5,122,664
Change from No-Build	+162,548	+161,463

1 CO_2 tons/year

Under Scenario 1, induced growth would increase VMT by 5,123,749 per day by 2035; an increase of 162,549 more VMT per day than the No-Build Alternative. The largest increases are expected in Fall River, Taunton, and Westport.

Under Scenario 2, implementing Smart Growth measures is anticipated to shift some new development from the PPAs to targeted development areas, and to allow more dense residential and mixed-use development in the PDAs. Scenario 2 is anticipated to increase VMT by 5,122,664 per day by 2035. The largest increases are expected in Fall River, Middleborough, and Taunton. The Stoughton and Whittenton Alternatives under the Smart Growth scenario are anticipated to result in 1,805 less VMT per day than Scenario 1. Relative to the No-Build Alternative, Scenario 2 would increase VMT by 161,464 per day (3 percent).

5.3.4.9 Economic Effects

The economic analysis of the South Coast Rail project as reported in the Corridor Plan and Chapter 4.3, *Socioeconomics*, estimated the overall direct and indirect economic effects on the South Coast region as a result of implementing the Build Alternatives, based on the TREDIS model. Communities across the region can expect to benefit from additional tax revenues from growth, but they should also expect some infrastructure costs for roads, water, and wastewater systems. The following provides a qualitative assessment of potential economic effects associated with the South Coast Rail project.

No-Build Alternative

Under the No-Build Alternative it is projected that an additional 75,212 households and 37,865 jobs would be introduced to the South Coast region by 2035. Municipalities across the region would experience economic benefits in the form of additional property tax revenue, such benefits would be greater in those municipalities where growth is projected to be higher such as Fall River, New Bedford, and Taunton. However, the extent of additional tax revenue that is recognized from new residential development would also depend on municipal property tax rates – a determination that is beyond the scope of this project. Increased employment activity as a result of new residential development and job creation would also result in increased economic benefits, the extent to which would be recognized the most in areas where job growth is highest.

Scenario 1

Under Scenario 1 of the Build Alternatives, household and employment growth would continue as under existing conditions and would not include smart growth measures. An additional 2,804 households and 1,341 jobs are projected to be introduced to the South Coast region over the No-Build Alternative. Municipalities would recognize economic benefits as a result of increased property tax revenues and employment activity. Municipalities with the greatest projected growth and highest tax rates would recognize the greatest economic benefits as a result of such development. Municipalities where the greatest residential growth is projected over the No-Build Alternative include Fairhaven, Fall River, and

New Bedford. Easton, Taunton, and New Bedford are projected to experience the greatest job growth of study area municipalities. However, Scenario 1 would help retain 194 jobs in Fall River, one of the municipalities projected to experience significant job loss by 2035.

Scenario 2

Scenario 2 of the Build Alternatives assumes that smart growth measures would be implemented in accordance with the Corridor Plan and municipal objectives. Growth, both residential and employment, would be concentrated around PDAs and away from environmentally-sensitive areas (PPAs). While overall growth numbers (both residential and employment) is anticipated to occur on a similar scale under both Scenario 1 and Scenario 2, such development would be redistributed across the South Coast region differently than under Scenario 1.

Under Scenario 2, municipalities such as Stoughton, among others are projected to experience notable residential growth over Scenario 1 and the No-Build Alternative. As a result, these municipalities are anticipated to receive more in property taxes than they would under Scenario 1. Other municipalities such as Fall River, New Bedford, Lakeville, Raynham, and Westport, among others are projected to experience less residential development than under either the No-Build Alternative or Scenario 1. As a result, it is anticipated that these municipalities would experience less property tax revenue than under other alternatives.

Job growth is projected to be concentrated in Bridgewater, Easton, and Foxborough as compared to either the No-Build Alternative or Scenario 1. These municipalities, particularly Foxborough, would experience the greatest economic benefit of smart growth measures and increased employment. The majority of other municipalities are projected to experience a slight decrease in their employment base under Scenario 2 as compared to the No-Build Alternative and Scenario 1. Because projected employment loss represents such a small share of overall municipal employment, it is not anticipated that such a decrease would adversely affect tax revenues in a significant fashion as compared to the Bo-Build Alternative.

5.4 CUMULATIVE IMPACTS

This section describes the cumulative impacts of the South Coast Rail project on the following resources: air quality, biodiversity, economy, land use, protected open space, threatened and endangered species, water quality, and wetlands

5.4.1 Land Use

Land use in Massachusetts is directly regulated at the local level, typically through municipal zoning laws and ordinances. Although unique to each municipality, zoning laws commonly designate land usage (into categories such as residential, commercial, industrial, and open space) and development density (for different types of land use such as multi-family or single-family homes, and lot size). Indirect regulation from federal and state agencies derives from policies established by land management agencies responsible for federal- or state-owned property, as well as certain programs such as the federal Wild and Scenic River program (which protects designated waterways) and the state ACEC program. Additionally, traditional environmental media-oriented laws can function as *de facto* land use regulatory programs; new facilities with air emissions or wastewater discharges, for example, may not be permitted in certain locations if the project design cannot meet air quality or water quality standards or requirements.

Managing land use, and in particular motivating a change in land use, may be accomplished by financial or other incentives. Tax increment financing and TDR programs, potential components identified in the Corridor Plan, may be used by the state to motivate local land use change. To that end, the state has assisted each community in identifying PDAs and PPAs that would focus development in certain areas and limit it in others. These programs are intended to limit sprawl – a potential negative indirect effect of the South Coast Rail project.

This section evaluates the cumulative impacts of converting land from a natural state to developed land. Current land use within the South Coast region reflects the historical development of the area. Although much of the land is considered open space (forest, parks, farmland, or otherwise undeveloped land), no areas are completely undisturbed by human activity. Native Americans disturbed the natural environment prior to arrival of Europeans in the 1600s; forest fires were set to clear land and hunt for wildlife.[20] Development by European immigrants included establishing the villages that have grown into the communities currently present. Forests were cut for fuel and construction materials. Old growth forests (defined as having not been logged or disturbed for over 150 years) in the South Coast region are limited to 400 acres of the Acushnet Cedar Swamp, in which old-growth stands of Atlantic white cedar provide about 25 percent of the vegetative cover.[21] The industrial age concentrated development at locations with certain required resources (e.g., Fall River, where river flow powered mills) or convenient for transporting goods (e.g., New Bedford, with a protected harbor for seafaring). Agricultural land use also changed the landscape with forests cleared for crops.

As described in Chapter 4.14, *Biodiversity*, *Wildlife, and Vegetation*, a perspective of recent historical changes in land use is offered by the MassAudubon *Losing Ground* study series. The study was originally published in 1987, with new editions in 1999, 2003, and 2009. Each edition documents broad changes in land use over time. Although the study series provides a state-wide analysis, some aspects are community-specific or can be applied at the regional level.

The 1987 study[22] found that, statewide, open land developed for residential and commercial use between 1981 and 1986 totaled 103,000 acres (20,600 acres per year). The average growth in land development for that period was 2 percent per year. The 1999 study[23] analyzed land development in Massachusetts from 1971 to 1996 and found that the average annual rate of land conversion statewide had decreased from nearly 21,000 acres per year in the mid-1980s to just under 16,000 acres per year in the late 1990s. It further states that developed land has increased from 15.0 percent in 1972 to 23.8 percent in 1996.

Although the 1999 report does not provide community-specific data, the 31 South Coast study area communities in Massachusetts lie within areas characterized as under the greatest development pressure in the period from 1980 to 1996. The six northernmost communities in the South Coast region fell within a middle range of development with 36 to 60 acres developed per square mile of each municipality for that period. The thirteen communities in the central/southern portion varied considerably in newly developed acreage with Mansfield in the highest category of 102 to 169 acres developed per square mile. The twelve communities along the coast generally fell within the lowest ranges of newly developed land with only Fairhaven and Marion reaching the same middle range as the

[20] Jorgensen, N. 1978. *A Sierra Club Naturalist's Guide to Southeastern New England*. Sierra Club Books: San Francisco.

[21] Davis, M.B. 2008. *Old Growth in the East* (revised survey).Available on-line at http://www.primalnature.org/ogeast/survey.html. Accessed 6 October 2009.

[22] MassAudubon 1987. *Losing Ground: The Case for Land Conservation in Massachusetts*. Massachusetts Audubon Society: Lincoln, MA.

[23] MassAudubon 1999. *Losing Ground (Second Edition): An Analysis of Recent Rates and Patterns of Development and Their Effects on Open Space in Massachusetts*. Massachusetts Audubon Society: Lincoln, MA.

northern communities. These data suggest the greatest development pressures closest to the Boston metropolitan area, with decreasing development pressure (and some local variation) with increasing distance from Boston.

The 2003 study[24] focused on changes from 1985 to 1999 in forest and agricultural land use to residential and commercial development, and the hidden impacts of development. MassAudubon calculated an average visible (in aerial photographs) conversion of 40 acres per day of which 88 percent was attributable to new residential development.

According to the 2009 study,[25] natural land in 2005 for the 31 South Coast Study area municipalities in Massachusetts totaled 347,263 acres (an average of 11,202 acres per community). In the period from 1999 to 2005, 7,888 acres (2.2 percent of the 1999 total) in those 31 communities had been converted from natural land to developed land. The average annual natural-to-developed land conversion rate in the South Coast region was 1,315 acres. The conversion rate varies by community, generally according to zoning densities.

The Corridor Plan depicts current land uses for the entire South Coast region based on generalized community zoning.[26] Chapter 4.2, *Land Use, Zoning and Public Policy*, provides maps indicating land uses and zoning along each alternative alignment. These figures also show that residential zoning dominates the South Coast region (at varying degrees of density), although much of the land is actually undeveloped (see *Corridor Plan*, Figure 4-5). Concentrated residential, commercial, and industrial use occurs at the larger towns in the region: New Bedford, Fall River, Taunton, Attleboro, Mansfield, Stoughton, and Canton.

Differences in development density are also reflected, to some degree, in a north-to-south direction. The Corridor Plan's characterization of community's urban, suburban, or semi-rural character (see *Corridor Plan*, Figure 4-1) reflects this geographic trend, combined with the concentrated development at selected coastal communities.

Current and foreseeable projects as mentioned above are commonly located within or near the concentrated development of existing communities or along transportation corridors. Many of these projects consist of redevelopment of industrial property, such as the redevelopment of the Fall River Airport as the Fall River Commerce Park. This project generally does not constitute land use changes from undeveloped to developed land as most of the areas were previously disturbed.

One future project with a specific land use change, the proposed Route 24 Access Improvement Project, would convert 16.6 acres of forest (undeveloped) land to transportation use for a new interchange.[27] Numerous additional projects, at varying degrees of planning or speculation, are listed in the Corridor Plan as candidates for PDAs under Scenario 2.[28] Quantifiable land use conversions are not available for

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[24] MassAudubon 2003. *Losing Ground: At What Cost? (Third Edition of the Losing Ground Series), Changes in Land Use and Their Impact on Habitat, Biodiversity, and Ecosystem Services in Massachusetts*. Massachusetts Audubon Society: Lincoln, MA.

[25] MassAudubon. 2009. *Losing Ground: Beyond the Footprint* website: http://www.massaudubon.org/losingground/. Accessed 5 October 2009.

[26] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. See Figure 4-6: South Coast Zoning.

[27] US DOT. 2009. Route 24, Fall River and Freetown, Massachusetts, Access Improvements Project,; Environmental Assessment, Draft Individual Section 4(f) Evaluation, and Final Environmental Impact Report. US Department of Transportation, Federal Highway Administration and Commonwealth of Massachusetts, Massachusetts Highway Department: Cambridge and Boston, MA.

[28] EOT. 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston.

all future projects. As noted in Table 5.4-1, the total area encompassed by the PDAs in the 31 South Coast study area municipalities in Massachusetts is 29,079 acres; it is not known what proportion of that area would be converted from undeveloped to developed land if each project was completed.

Table 5.4-1 PDAs and PPAs in the 31 South Coast Communities in Massachusetts

Community	Total Area (acres)	Priority Development Areas		Priority Protection Areas	
		Area (acres)	Percent	Area (acres)	Percent
Acushnet	12,064	44	0.36	591	4.90
Attleboro	17,815	2,024	11.36	26	0.15
Berkley	10,604	200	1.89	2,269	21.40
Bridgewater	18,179	1,460	8.03	3,323	18.28
Canton	12,487	1,256	10.06	3,683	29.49
Dartmouth	39,763	2,160	5.43	19,000	47.78
Dighton	14,268	30	0.21	1,631	11.43
Easton	18,709	1,195	6.39	7,499	40.08
Fairhaven	8,006	333	4.16	583	7.28
Fall River	24,756	1,912	7.72	533	2.15
Foxborough	13,342	1,120	8.39	2,235	16.75
Freetown	22,710	1,023	4.50	2,805	12.35
Lakeville	23,102	238	1.03	11,210	48.52
Mansfield	13,088	1,061	8.11	5,429	41.48
Marion	9,054	52	0.57	1,316	14.54
Mattapoisett	11,167	76	0.68	3,265	29.24
Middleborough	46,194	3,000	6.49	12,553	27.17
New Bedford	12,894	2,251	17.46	1,052	8.16
North Attleborough	12,418	899	7.24	1,632	13.14
Norton	18,724	333	1.78	10,234	54.66
Raynham	13,279	605	4.56	3,576	26.93
Rehoboth	30,371	215	0.71	3,226	10.62
Rochester	23,111	56	0.24	9,044	39.13
Seekonk	11,917	306	2.57	848	7.12
Sharon	15,626	153	0.98	2,780	17.79
Somerset	5,233	104	1.99	200	3.82
Stoughton	10,530	1,226	11.64	1,207	11.46
Swansea	14,834	490	3.30	2,047	13.80
Taunton	30,973	4,849	15.66	11,250	36.32
Wareham	23,951	242	1.01	6,904	28.83
Westport	33,068	166	0.50	7,807	23.61
TOTAL	572,237	29,079	5.08	139,758	24.42

Source: Corridor Plan, Figure 6-2 Corridor Map.

Based on the land use impacts presented in Table 5.3-3, approximately 38,892 acres of natural land would be converted to developed land by 2035 under the No-Build Alternative, representing approximately 11.2 percent of the 347,263 acres of natural land present in the South Coast region in

2005. Approximately 308,371 acres of natural land would remain in the South Coast region in 2035 under the No-Build Alternative.

Property acquisitions are used as a convenient indicator of direct land use impacts. The Stoughton Alternative would involve acquisition of 49.8 acres and the Whittenton Alternative would involve acquisition of 39.6 acres of undeveloped land. The greater land acquisition requirements for the Stoughton Alternative are in large part a result of a need to re-acquire the rail right-of-way between Route 138 and Winter Street in Raynham and Longmeadow Road in Taunton, which does not exist under the Whittenton Alternative. In addition to changes in ownership, both alternatives would convert undeveloped land (both in areas currently owned by MassDOT and in new property acquisitions) to transportation use as part of reactivation of rail service to abandoned corridors. Table 5.4-2 shows that the indirect effect on land use under Scenario 1 would be the conversion of 40,184 acres of undeveloped land to developed land, for a combined total of direct and indirect conversion of 40,234 acres for the Stoughton Alternative and 40,223 acres for the Whittenton Alternative. Combining historic trends in land use conversions, recent or reasonably foreseeable future actions, and the varying land conversions that would result from the Stoughton and Whittenton Alternatives, cumulative impacts of the South Coast Rail project to land use in 2035 are presented in Table 5.4-2.

Approximately 308,371 acres of natural land would remain in the South Coast region in 2035 under the No-Build Alternative. Under Scenario 1, approximately 307,029 acres of natural land would remain under the Stoughton Alternative and 307,040 acres would remain under the Whittenton Alternative. The difference between the Build Alternatives is negligible in a regional context and is due to the greater direct impact (land acquisition) requirements for the Stoughton Alternative noted above. However, it is important to note that direct land conversion (reactivation of rail corridors) would not be limited to the areas of property acquisitions (see Chapter 3 for description and mapping of areas where rail service would be reactivated under the Stoughton and Whittenton Alternatives). The additional loss of 1,331 to 1,342 acres from induced growth indirectly resulting from the Stoughton or Whittenton Alternatives plus direct land acquisition impacts under Scenario 1 would represent approximately 0.4 percent of the total natural land area.

Table 5.4-2 Cumulative Impacts to Land Use in 2035 (in acres)

Historical Trends Affecting Land Use	Trends and Current of Future Actions Affecting Land Use	Alternative	Land Use Conversion: Project Direct and Indirect Effects	Natural Land Remaining in 2035	Change from no-Build	% Change from No-Build
Land conversion for agricultural, residential, commercial, and industrial development	Average land conversion of 1,315 acres per year	No-Build	N/A	308,371	N/A	N/A
				Build Alternatives		
				Scenario 1		
		Stoughton	40,234	307,029	-1,342	-3%
		Whittenton	40,223	307,040	-1,331	-3%
				Scenario 2		
		Stoughton	28,005 to 31,681	315,582 to 319,258	-7,213 to -10,889	19% to 28%
		Whittenton	27,994 to 31,670	315,593 to 319,269	-7,232 to -10,898	19% to 28%

Under Scenario 2 low and high implementation of smart growth measures, approximately 315,582 and 319,258 acres of natural land would remain, respectively, for the Stoughton Alternative. For the Whittenton Alternative, 315,593 to 319,269 acres would remain. Approximately 7,213 to 10,898 fewer acres would be lost to development under Scenario 2 than under the No-Build Alternative, a decrease of up to 28 percent. The Build Alternatives would not result in substantial adverse cumulative impacts to land under Scenario 1 and Scenario 2 would substantively slow the rate of land conversion.

5.4.2 Protected Open Space

Publicly owned protected open spaces are regulated by the agency responsible for the property (whether federal, state, or local). Privately owned protected open spaces are not directly regulated by a governmental agency unless a deed restriction (such as a conservation agreement) is attached to the property. At all levels, conversion of publicly or privately owned protected open space to other uses is strongly regulated.

Through a variety of legal vehicles (such as actual ownership or conservation restrictions), public and private entities have protected open space from development throughout the state. In the period from 1999 and 2005, 109,863 acres of open space were newly protected from development.[29] In 2008, an additional 24,104 acres of land were protected by state action[30] and another 54,818 acres were protected in 2009.[31]

Data regarding the total area of recent protections to open space in the South Coast region were not readily available. Using the Commonwealth open space acquisition assumptions, protected open space would expand by 0.7 percent per year (14.7 percent overall), or about 383.7 acres per year (9,976 acres total), resulting in approximately 64,795 acres of protected open space in the South Coast study area municipalities in Massachusetts by 2035.

Under Scenario 1, approximately 64,794 acres of open space would remain under the Stoughton and Whittenton Alternatives. The additional loss of less than 0.66 acre of direct impacts from the Stoughton and Whittenton Electric Alternatives would represent approximately 0.001 percent of the total protected open space area in the South Coast region. Open space impacts for Scenario 2 are unknown but presumably greater than 0.66 acre; however, less open space would be lost to development under Scenario 2 than under the No-Build Alternative or Scenario 1 due to implementation of smart growth measures. The Build Alternatives would not result in substantial adverse cumulative impacts to open space under Scenario 1 and Scenario 2 would slow the rate of land conversion as compared to the No-Build Alternative.

The Corridor Plan identifies 72 PPAs but does not quantify the area of the PPAs nor specifically identify where candidate PPA sites would qualify for protection as public open space status under Article 97 of the Massachusetts Constitution. Although the implementation of smart growth measures of the Corridor Plan would orient growth away from PPAs, new protected open space would not be formally established under Scenario 2. Separate initiatives would be required to designate additional protected open space; however, it is not possible to accurately project the extent of any new protected open space that could be designated. Based on these factors, speculations on increases in protected open

[29] MassAudubon 2003. Losing Ground: At What Cost? (Third Edition of the Losing Ground Series), Changes in Land Use and Their Impact on Habitat, Biodiversity, and Ecosystem Services in Massachusetts. Massachusetts Audubon Society: Lincoln, MA.
[30] EEA. 2008. 2008 Land Protection Report. Executive Office of Energy and Environmental Affairs: Boston.
[31] MassGIS. 2009. Database on website: http://www.mass.gov/mgis/mapping.htm. Accessed on 7 October 2009.

space that may result from the establishment of PPAs do not meet the definition of "reasonably foreseeable projects" for a cumulative impacts analysis.

Combining historic trends of increasing protection of open space and the varying effects on protected open space that would result under the South Coast Rail project by 2035 are presented in Table 5.4-3.

Table 5.4-3 Cumulative Impacts to Protected Open Space in 2035 (in acres)

Historical Trends Affecting Open Space	Trends and Current or Future Actions Affecting Protected Open Space	Alternative	Protected Open Space			
			Project Direct and Indirect Effects	Protected Open Space in 2035	Change from No-Build	% Change from No-Build
State commitment to protect open space through acquisition, spending $50M per year	Open space protected at a rate of 383.7 acres per year	No-Build	N/A	64,795	N/A	N/A
		Build Alternatives				
		Scenario 1				
		Stoughton	0.66*	64,794	-0.66	<-1%
		Whittenton	0.66*	64,794	-0.66	<-1%
		Scenario 2				
		Stoughton	>0.66	>64,794	Unknown	Unknown
		Whittenton	>0.66	>64,794	Unknown	Unknown

Note: *0.66 acre for Stoughton and Whittenton Electric Alternatives. Impact is 0.16 acre for the Stoughton and Whittenton Diesel Alternatives.

5.4.3 Wetlands

Wetlands protection is closely related to the surface water quality laws and regulations mentioned above. Specifically, at the federal level, Section 404 of the CWA requires a Department of the Army permit for the discharge of dredged or fill material into waters of the United States, including adjacent wetlands. The Massachusetts WPA and WPA Regulations provide state protection. As mentioned above, a federal "no net loss" policy requires mitigation of wetland impacts. Only one community within the South Coast Rail study area, Westport, has registered wetlands within its boundary and has adopted restriction orders in compliance with the Coastal Wetlands Restriction Act or Inland Wetlands Restriction Act.

Wetlands in Massachusetts are currently protected at both the federal and state level.[32] Regulatory programs implementing the federal CWA, as administered by the Corps, are conducted in compliance with the national policy of "no net loss" of wetlands.[33] At the state level, the regulatory programs implementing the Massachusetts Clean Waters Act and the Massachusetts WPA, administered by MassDEP, provide similar wetlands protection. The USEPA notes that activities in upland areas outside of regulatory control may degrade wetlands quality, if not quantity.

Existing wetlands in the South Coast region reflect the long history of land use change described in Section 5.4.1. Wetland areas in Massachusetts in the 1780s totaled approximately 818,000 acres,

[32] Only one community (Westport) in the South Coast region has adopted wetland restriction orders in compliance with state laws, but all of the communities could do so.

[33] White House Office on Environmental Policy. 1993. Protecting America's Wetlands: A Fair, Flexible, and Effective Approach. Washington, DC.

representing about 15.5 percent of the state's 5,284,480 acres.[34] By the 1980s, the total wetland area decreased to approximately 588,486 acres, representing 11.1 percent of the total area of the state and a 28-percent decrease over the 200-year period. In 1992, this had further decreased to only 6 to 7 percent of total Commonwealth land.[35]

Wetlands loss rates, both in terms of the numbers of acres lost annually and percentage of total wetland area, have varied substantively over time. Losses can be attributed to several different types of conversions, which have also changed over time. The loss of 229,514 acres of wetlands in 200 years averaged nearly 1,150 acres per year, a 0.14 percent annual loss rate. In 1978, the U.S. Soil Conservation Service[36] estimated Massachusetts' annual wetland loss rate at 0.4 percent, and attributed the losses primarily to urbanization. Historically, the state has lost between 58 and 64 percent of its wetlands from conversion to agriculture, road construction, and other building projects.[37]

Recently, MassDEP initiated a wetlands loss mapping project, which includes a review of recent historical and current aerial photographs to more precisely identify wetland losses by comparing aerial photographs taken in 1990, 2001, and 2005. These losses include both legal[38] (permitted) and illegal (unpermitted) wetland loss. Wetlands lost by a permitted activity may have been mitigated by the project proponent through the creation of new wetlands. The mapping program cannot distinguish newly created wetlands from naturally existing wetlands. The values provided in the following summary are, therefore, conservative because they do not fully account for mitigated impacts. Because both the federal and state governments have "no net loss" policies for wetlands, legally "lost" wetlands have been mitigated at a replacement ratio of at least 1:1.

For the MassDEP Southeast Region (which includes the 31 South Coast Rail study area municipalities in Massachusetts), 545 acres of wetlands were lost from 1990 to 2001 (49 to 68 acres lost per year).[39] For the period from 2001 to 2005, 264 acres of wetlands were lost (66 acres per year) in the Southeast Region. These losses represent 62 percent of total wetland losses across the state during this time.[40] Currently, there are approximately 126,464 acres of wetlands in the 31 South Coast Rail study area municipalities located Massachusetts.[41] Conservatively assuming a consistent 66-acre-per-year loss rate,[42] 124,748 acres of wetlands would remain in 2035 (without considering mitigation under the state and federal "no net loss" requirements).

The wetlands loss mapping project allows for specific identification of conversion types, but data are not readily available at the regional level. Statewide, principal activities causing wetland loss varied. Table

[34] Dahl, T.E. 1990. *Wetlands Losses in the United States 1780's to 1980's.* U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 13pp.

[35] Tiner, R.W., D.B. Foulis, C. Nichols, S. Schaller, D. Petersen, K. Andersen, and J. Swords. 1998. Wetland Status and Recent Trends for the Neponset Watershed, Massachusetts (1977-1991).

[36] U.S. Department of Agriculture, Soil Conservation Service [now Natural Resources Conservation Service]. Referenced in "Natural Communities (from the Silvio O. Conte National Fish and Wildlife Refuge Final Action Plan and Environmental Impact Statement, October, 1995, U.S. Fish and Wildlife Service, Hadley, MA)."

[37] Tiner, R.W. and W. Zinni. 1988. Recent wetland trends in southeastern Massachusetts. US Fish and Wildlife Service. Newton Corner, MA.

[38] According to the DEP, legal losses "include permitted losses likely to have been replicated under permitting criteria. MassDEP is currently unable to identify replicated wetlands."

[39] DEP. 2009. *Wetlands PPA Summary and Workplan*. Commonwealth of Massachusetts, Department of Environmental Protection: Boston. Available at DEP website: http://www.mass.gov/dep/water/priorities/09wet.pdf. Accessed on 4 October 2009.

[40] DEP. 2008. The Environmental Progress Report FY 2008- Wetlands. Commonwealth of Massachusetts, Department of Environmental Protection: Boston. Website: http://www.mass.gov/dep/water/priorities/wlfy08.htm. Accessed 4 October 2008.

[41] MassGIS database: http://www.mass.gov/mgis/massgis.htm. Accessed 5 October 2009.

[42] This value is conservative because it represents the average annual loss in the DEP's Southeast Region, which is larger than the 31-community South Coast Rail study area.

5.4-4 identifies wetland losses attributed to 11 conversion types in 2004 and 2006. These data show a relative consistency of the percentage of wetland impacts attributable to residential development, at 22.5 percent in 2004 and 19.3 percent in 2006, for an average of 20.9 percent. Using this average and the average annual conversion rate of 66 acres per year in the MassDEP Southeast Region, approximately 13.8 acres of wetland loss per year can be attributed to residential development.

Table 5.4-4 Comparison of Statewide Wetland Conversion Types in 2004 and 2006

	Percentage of Total Conversion	
Wetlands Conversion Type	**2004**	**2006**
Agriculture	32.3	7.2
Commercial Development	18.7	12.5
Cranberry Bogs	(included in Agriculture)	9.6
Other	21.0	22.4
Gravel Operation	5.5	5.6
New Road	0.0	2.9
Dock or Pier	0.0	0.08
Residential Development	22.5	19.3
Transportation/Infrastructure	0.0	2.3
Clearing—unknown reason	0.0	16.4
Filling—unknown reason	0.0	1.6

Source: DEP. 2009. *Wetlands PPA Summary and Workplan*. Commonwealth of Massachusetts, Department of Environmental Protection: Boston.

It is not possible to define project-specific wetland losses that have or may occur from each of the recent or reasonably foreseeable activities evaluated in this chapter. Some projects have received or applied for wetland permits with the Corps and/or MassDEP, but there is not a clear indication of how recent wetland loss trends may change as a result of these and other projects. Lacking comprehensive project-specific data, it is reasonable to assume that the estimated 66 acres loss per year based on MassDEP recent data for the Southeastern Region would continue for the foreseeable future.

Chapter 4.16, *Wetlands*, concludes that direct permanent federal impacts to Waters of the U.S. under the electric versions of the Stoughton and Whittenton Alternatives would be 12.3 and 11.2 acres, respectively. Impacts of diesel alternatives would be slightly less than the electric alternatives. Based on regulatory requirements, these impacts would be mitigated at a 1:1, 2:1, or 3:1 ratio, depending upon the habitat type impacted. Therefore, direct wetlands impacts from the South Coast Rail project would not result in a net loss. As described in Chapter 4.16, 34.0 acres of wetlands are anticipated to be restored, replaced, or created to offset direct impacts of the Stoughton Alternatives and 31.0 of wetlands are anticipated to be restored, replaced, or created to offset direct impacts of the Whittenton Alternatives.

Under Scenario 1, wetland losses from induced growth are estimated to be 7.35 square feet per new household. This would decrease to between 5.15 to 5.81 square feet per new household with the implementation of smart growth measures under Scenario 2. Under Scenario 1, approximately 124,754 to 124,756 acres of wetlands would remain in 2035 under the Whittenton and Stoughton Alternatives, respectively. For Scenario 2 there would be a net increase of 9.5 to 12.0 acres, therefore approximately 124,757 to 124,760 acres of wetlands would remain in 2035, based on low to high implementation of smart growth measures under Scenario 2 of the Build Alternatives.

Table 5.4-5 provides an overview of direct and indirect effects and includes the consideration of mitigation measures to identify total wetland area in 2035 under the Build Alternatives. Mitigation for wetland losses indirectly resulting from the project are not included in this evaluation because mitigation ratios are unknown but would likely range from 1:1 to 3:1. It is assumed that mitigation would result in a replacement greater than 1:1 (e.g., no net loss); thus, there would be an increase in wetlands remaining in 2035 under the Build Alternatives as compared to the No-Build Alternative.

Table 5.4-5 Cumulative Impacts to Wetlands in 2035 (in acres)

			Wetlands			
Historical Trends Affecting Wetlands	**Trends and Current or Future Actions Affecting Wetlands**	**Alternative**	**Project Direct and Indirect Effects**	**Wetlands Remaining in 2035**	**Change from No-Build**	**% Change from No-Build**
Historical wetland loss; recent Federal and State wetland regulations	No net loss policy; mitigation (replacement) ratios from 1:1 to 3:1	No-Build	N/A	124,748	N/A	N/A
		Build Alternatives				
		Scenario 1				
		Stoughton	8.1	124,756	8.0	0.01%
		Whittenton	6.3	124,754	6.3	0.01%
		Scenario 2				
		Stoughton	11.3 to 12.0	124,759 to 124,760	11.3 to 12.0	0.01%
		Whittenton	9.5 to 10.2	124,757 to 124,758	9.5 to 10.2	0.01%

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5.4.4 Biodiversity

Biodiversity is not regulated by federal, state, or local agencies. However, evaluation of project impacts to biodiversity is typically a component of NEPA and MEPA analyses for federal and state agencies. This evaluation of the cumulative impacts to biodiversity is based, in part, on historical data from non-governmental sources rather than regulatory agency records.

Loss of biodiversity is linked to increases in land use: undeveloped land has higher biodiversity than developed land. Historical trends in land conversion, therefore, assist in understanding trends in loss of biodiversity. The Corridor Plan states that "more land had been developed in the South Coast region since 1960 than in the previous 340 years and that land development was occurring at 2.5 times the rate of population growth." At a more detailed level, the MassAudubon's *Losing Ground* report series includes an analysis of land use changes throughout Massachusetts from 1971, 1985, 1999, and 2005 data. The report notes that statewide 22 acres of natural land were developed per day during the period between 1999 and 2005, as compared to 40 acres per day between 1985 and 1999. Although land conversion is ongoing, the trend is of decreasing rates of conversion.

As described in Chapter 4.2, *Land Use*, and according to *Losing Ground*, natural (undeveloped) land in 2005 for the 31 South Coast communities in Massachusetts totaled 347,263 acres. In the period from 1999 to 2005, 7,888 acres (2.2 percent of the 1999 total) in those 31 communities had been converted from natural land to developed land. It is assumed that the natural-to-developed land conversion rates calculated by MassAudubon are likely to continue for the foreseeable future. Based on this rate, by 2035

approximately 39,450 acres of natural land would be converted to developed land. This is slightly greater than the amount of land conversion estimated under the No-Build Alternative (38,892 acres). Under the Build Alternatives, between 27,995 acres and 40,184 acres would be converted to support residential development by 2035 depending on which scenario is implemented (see Table 5.3-3). Assuming that natural land is developed as projected under the South Coast Rail project, between 307,079 acres and 319,268 acres of natural land would remain in 2035.

Several plots of land throughout the South Coast region have been set aside for conservation purposes, including the preservation of biological resources (see Chapter 4.10, *Open Space and ACEC*). One example would be the Southeastern Massachusetts Bioreserve (Bioreserve), a 13,600-acre area just east of Fall River, which was established to protect, restore, and enhance the biological diversity and ecological integrity of a large ecosystem representative of the region.[43] The Bioreserve comprises portions of the Freetown/Fall River State Forest, Acushnet Wildlife Management Area, watershed and conservation lands owned by the City of Fall River, and the former Acushnet Saw Mills property. The Bioreserve land is owned by the Commonwealth of Massachusetts, City of Fall River, and Trustees of Reservations. Lands for the Southeastern Massachusetts Bioreserve are still being acquired. There will be no economic development activities within the protected lands of the Bioreserve.

At least one recent project has specifically converted undeveloped to developed land, affecting biodiversity in the South Coast region. The golf course adjacent to the Great Woods Conservation Area in Mansfield converted 400 acres of forest land to developed land (landscaped golf course and appurtenant facilities).[44] Somewhat more historically, the construction of the numerous linear transportation facilities (surface streets, highways, and railroads) as well as utility corridors (aerial electric transmission lines and pipelines) from the late 1800s through the present time has fragmented the landscape, reducing biodiversity by segregating populations of low-mobility species by creating physical or psychological barriers to movement. Highway construction projects, such as I-195 and I-495, continued until the late 1900s.

Several reasonably foreseeable future actions could adversely impact biodiversity:

- Implementation of the Taunton Comprehensive Wastewater Management Plan may impact diadromous fish populations within the Taunton River and Three Mile River.[45]

- Numerous ongoing or anticipated developments throughout the South Coast region, as outlined in the Corridor Plan, will likely convert natural land to developed land. (Note, however, that many of these developments do not qualify as "reasonably foreseeable future actions" as defined above.)

As mentioned above, no new highway projects are currently anticipated in the South Coast region, therefore, biodiversity would not be impacted by any planned transportation improvements.

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[43] Bioreserve Partners. 2009. Facts about the Southeastern Massachusetts Bioreserve. Green Futures website: http://www.greenfutures.org/projects/green/biofacts.html. Accessed 29 October 2009.

[44] Chase, H.B. Jr. 2009. Great Woods Today. Natural Resources Trust of Mansfield website: http://home.comcast.net/~nrtma/html/today.html. Accessed on 12 October 2009.

[45] EEA. 2009. Certificate of the Secretary of Energy and Environmental Affairs on the Notice of Project Change, Comprehensive Wastewater Management Plan (Winthrop Street, Davenport Terrace, Williams Street Sewer Extension). Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs: Boston.

Historic trends and current or future projects suggest that land development in the South Coast region is likely to continue for the foreseeable future. As discussed in MassAudubon's *Losing Ground* report series and reflected in the Corridor Plan, development generally propagates outward from the Boston metropolitan area, with a "sprawl frontier" of urban-character communities in the northern portion of the South Coast region and decreasing development density farther south into suburban and rural communities. Accordingly, there is a potential for greater conversion in the southernmost communities because the northernmost communities have already converted much of their land. Although the rate of conversion has slowed in recent years, the South Coast communities have not reached build-out. The South Coast region will likely experience continued loss of biodiversity correlated with land development in the foreseeable future irrespective of the South Coast Rail project.

In addition to these identifiable, specific human activity trends and projects, global warming may have local effects on biodiversity. Recent studies predict the effects of climate change in New England that could dramatically change the distribution of plant communities and some animal species. New England's average summer temperatures are anticipated to increase by 2 to 3°F by 2040, and by 6 to 14°F by the end of the century, resulting in a summer climate similar to that of North Carolina.[46] Winters are also predicted to be warmer, by 8 to 12^{0}F, with fewer snow-covered days. These changes are expected to be accompanied by longer growing seasons, increasing by 4 to 6 weeks by 2099.

These changes are predicted to affect the distribution of plant species, with most tree species shifting their range north by at least 300 miles. The effects are highly uncertain; however, Frumhoff et al. predict that Southeastern Massachusetts would likely retain the same dominant forest type.[47] Changes in plant distributions are likely to occur more slowly than for animals, as a result of the longer generation times, and that changes in vegetation are likely to be complex and result from a combination of the effects of changing temperature, precipitation, snow cover, and other factors.[48]

Sea level, which has been rising since the end of the last glaciations, is predicted to accelerate. Even in the absence of climate change, sea levels will be 6 inches higher by 2099. There is a range of predictions for the added effects of climate change, from 17 inches to more than 4 feet (assuming that the Greenland ice cap does not melt catastrophically). Sea level rise could result in the loss of much of New England's coastal salt marshes if sediment accretion does not keep pace with sea level rise and if topography and development at the current upland edges of salt marshes do not allow marshes to migrate landward.

Predictions for animal communities also suggest that some bird and mammal species could shift distributions northward as forest plant community composition and temperature extremes change. This is particularly the case for species whose present northern limit is linked to winter temperatures and snow cover. Warmer winters and less snow cover could allow these species to expand into New England. Other concerns with regard to wildlife habitat include changes in hydrography and increasing temperatures of stream waters, potentially affecting reproduction or survival of cold water fish, or changes in precipitation patterns that potentially alter the hydroperiod of vernal pools and affect reproductive success of obligate vernal pool amphibians. Vernal pools are particularly sensitive to change in precipitation and evapotranspiration rates. Climate change predictions of more episodic

[46] Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, D.J. Wuebbles. 2007. *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions.* Synthesis report of the Northeast Climate Impacts Assessment (NECIA), Cambridge MA: Union of Concerned Scientists. USC Publications

[47] Ibid.

[48] Bertin, R.I. 2008. Plant phenology and distribution in relation to recent climate change. J. Torrey Bot. Soc. 135: 126-146.

precipitation and increased evapotranspiration rates suggest that vernal pools would dry earlier in the year and stay dry longer.[49]

With these exceptions, plant and animal communities within the South Coast Rail study area are not anticipated to change substantially with projected climate change because these areas primarily support plant and animal communities with a more southern coastal plain distribution (the coastal plain extends from New Hampshire to Virginia), rather than the more vulnerable northern forest communities of northern New England. Salt marshes, cold-water fisheries, and vernal pools are the most vulnerable elements of the South Coast area.

The Stoughton and Whittenton alternatives would directly impact 11.2 to 12.3 acres of vegetated wetlands and 182 to 188 acres of upland wildlife habitat. Table 5.4-6 shows that the indirect effect on biodiversity from the Stoughton and Whittenton Alternatives under Scenario 1 would be the loss of 120,551 acres of habitat. The table compares combined historic trends in land conversion, recent or reasonably foreseeable future actions, and the range of land conversion that would result from the No-Build Alternative and under the two scenarios of the Stoughton and Whittenton Alternatives.

Table 5.4-6 Cumulative Biodiversity Impacts in 2035

Historical Trends affecting Biodiversity	Trends and Current or Future Actions Affecting	Alternative	Land Conversion (acres of reduced value)			
			Project Direct and Indirect Effects[1]	Natural Land Remaining in 2035	Change from No-Build	% Change from No-Build
40 acres per day land conversion; ecosystem fragmentation	22 acres per day land conversion; additional habitat degradation; climate change	No-Build	N/A	307,813	N/A	N/A
		Build Alternatives				
		Scenario 1				
		Stoughton	120,605	303,883	-3,933	-1%
		Whittenton	120,595	303,893	-3,920	-1%
		Scenario 2				
		Stoughton	58,760 to 75,021	349,467 to 365,728	+41,654 to +57,915	+14% to +19%
		Whittenton	58,750 to 75,011	349,477 to 365,738	+41,664 to +57,925	+14% to +19%

1 The four high-biodiversity habitat types (upland, wetland, vernal pool- wetland, and vernal pool- supporting upland) have been summed only to illustrate the area of land conversion; they are not of equivalent biodiversity value.

Approximately 307,813 acres of natural land would remain in the South Coast region in 2035 under the No-Build Alternative, after 116,675 acres of habitat loss. For the Stoughton Alternative under Scenario 1, approximately 303,883 acres of natural land would remain, after 120,605 acres of habitat loss. For Scenario 2, approximately 349,467 to 365,728 acres of natural land would remain, with low and high implementation of smart growth measures, respectively, after between 58,760 and 75,021 acres of habitat loss. The cumulative impacts of the Whittenton Alternative would be very similar to the Stoughton Alternative.

[49] Brooks, R.T. 2004. Weather-related effects on woodland vernal pool hydrology and hydroperiod. In *Wetlands.* (Vol. 24, No. 1, pp 104-114). The Society of Wetland Scientists.

Under Scenario 1, the Build Alternatives would result in approximately 1 percent more conversion of undeveloped land as compared to the No-Build Alternative. Under Scenario 2, the Build Alternatives would result in 14 to 19 percent less conversion of undeveloped land than the No-Build Alternative.

Recent trends in land conversion and concomitant biodiversity loss described above in combination with the impacts from the Build Alternatives would:

- Under Scenario 1, result in little additional land conversion and habitat loss as compared to the No-Build Alternative, with resultant minimal impacts to biodiversity. A slight increase in the area of degraded habitat would also be realized in this scenario; or

- Under Scenario 2, contribute less to land conversion and habitat loss than the No-Build Alternative, with lower resultant impacts to biodiversity. Substantively less area of habitat would be degraded in this scenario.

5.4.5 Threatened and Endangered Species

Rare species are protected at the federal level by the US Fish & Wildlife Service, or the National Marine Fisheries Service, under the authority of the Endangered Species Act (ESA). At the state level, the Massachusetts Department of Fish and Wildlife (DFW) is responsible for administering the Natural Heritage and Endangered Species Program (NHESP) under the Massachusetts Endangered Species Act (MESA). Both classify rare species according to their risk of extinction, prohibit “take” of species except as authorized by permit (and usually requiring mitigation), and implement plans to assist in the recovery of those species.

Historical development of the South Coast region has impacted native plants and animals to the extent that some species are now rare and have received legal protection under state or federal law. Under MESA, an “Endangered” species is one that is in danger of extinction throughout all or a significant portion of its range within Massachusetts. A “Threatened” species is one that is likely to become endangered in Massachusetts in the foreseeable future. Species of Special Concern are those species where biological research has documented to have suffered a decline that could threaten the species if the decline continues unchecked, or those species that occur in such small numbers or with such a restricted distribution that they could easily become threatened within the Commonwealth. Similar definitions are used at the national level under ESA. Several state-listed rare species that are present in the South Coast region may be affected by the South Coast Rail project, as described in Chapter 4.15, *Threatened and Endangered Species*. No federally listed species would be affected by the South Coast Rail project. Table 5.4-7 identifies potentially impacted species and threats to each.

Historical and ongoing land development has converted natural land and altered wetlands and vernal pools, as described in Chapter 4.14, *Biodiversity*, *Wildlife, and Vegetation*; Chapter 4.2, *Land Use and Zoning*; and Chapter 4.16, *Wetlands*. A species now protected by either the ESA or MESA has been likely been adversely impacted by such historical activities. Federal and state laws, enacted in 1973 and 1990, respectively, now prohibit “take” of individuals and/or adverse impacts to their habitat except as permitted and usually with some mitigation requirement. Any major federal or state action (including providing funding or issuing a permit by an agency) requires analysis of impacts to listed species. Typically, projects adversely affecting listed species are not approved without a mitigation requirement. Project impacts to certain habitat types, such as wetlands and vernal pools, also typically require mitigation (for example, the “no net loss” policy for wetlands). However, some of the threats to listed species are not subject to ESA or MESA regulations.

Table 5.4-7 State-Listed Species Potentially Impacted by the South Coast Rail Project

Species	Listing Status	Threats
Marbled Salamander (*Ambystoma opacum*)	Threatened	Loss, degradation and fragmentation of both aquatic breeding pool habitat required for reproduction and terrestrial habitat needed for foraging, overwintering, growth and development to development and urbanization.
Blue-Spotted Salamander (*Ambystoma laterale*)	Species of Special Concern	Loss, degradation and fragmentation of both aquatic breeding pool habitat required for reproduction and terrestrial habitat needed for foraging, overwintering, growth and development to development and urbanization.
Wood Turtle (*Clemmys insculpta*)	Species of Special Concern	Hay-mowing operations, development of wooded stream banks, roadway casualties, incidental collection of specimens for pets, unnaturally inflated rates of predation in suburban and urban areas, forestry and agricultural activities, and pollution of streams.
Blanding's Turtle (*Emydoidea blandingii*)	Threatened	Habitat loss, degradation, and fragmentation (i.e., roads) driven by commercial and residential expansion. Other threats include illegal collection, unnaturally inflated rates of predation in suburban and urban areas, agricultural and forestry practices, and natural succession (i.e., loss of nesting habitat).
Eastern Box Turtle (*Terrapene carolina*)	Species of Special Concern	Habitat destruction resulting from residential and industrial development; road mortality; collection by individuals for pets; mowing of fields and early successional habitat during the active season; unnaturally inflated rates of predation in suburban and urban areas; disturbance of nest sites by ATVs; and genetic degradation due to the release of non-native (pet store) turtles.
Mocha Emerald (*Somatochlora linearis*)	Species of Special Concern	Stream damming or alteration; chemical pollution.
Hessel's Hairstreak (*Callophrys hesseli)*	Species of Special Concern	Habitat loss; suppression of disturbance (fire, flooding), or excessive deer browsing, preventing regeneration of Atlantic white cedar; hydrologic alteration; invasion by exotic plants; introduced generalist parasitoids; insecticide spraying
Pale Green Pinion Moth (*Lithophane viridipalle)*	Species of Special Concern	Habitat loss; hydrologic alteration; invasion by exotic plants; introduced generalist parasitoids; insecticide spraying; light pollution.
Water-Willow Stem Borer Moth (*Papaipema sulphurata)*	Species of Special Concern	Habitat loss; hydrologic alteration; invasion by exotic plants; introduced generalist parasitoids; insecticide spraying; light pollution.
Ringed Boghaunter (*Williamsonia lintneri)*	Endangered	Artificial changes in water level and various forms of pollution (such as agricultural and road runoff), septic system failure, insecticide spraying.
Long's Bulrush (*Scirpus longii*)	Threatened	Changes in the water quality and the natural fluctuating hydrologic regime of its habitat, invasion by exotic invasive plants, and exclusion of fire disturbance.

Source: NHESP Website: http://www.mass.gov/dfwele/dfw/nhesp/species_info/mesa_list/mesa_list.htm. Accessed 8 October 2009.

The New Bedford Airport Improvement Project is an example of an action in the South Coast region with potential impacts to protected species, particularly the eastern box turtle (*Terrapene carolina*) (Chapter 4.15, *Threatened and Endangered Species*). This project is required to obtain and comply with a Conservation and Management Permit to mitigate impacts to this species.

As described in Chapter 4.15, *Threatened and Endangered Species*, the South Coast Rail project would also include mitigation of direct or indirect effects to listed species' habitat, resulting in a net benefit to those species. Indirect effects from induced growth would be regulated by the ESA or MESA, and

relevant habitat protection laws for wetlands and vernal pools. Because of the overriding ESA and MESA regulations, there would be no difference in cumulative impacts to threatened or endangered species under the two scenarios even with full implementation of PPAs.

Several state-listed species could potentially experience cumulative adverse effects from the loss of habitat quality associated with habitat fragmentation from land development or climate change, as discussed in Chapter 4.14. Eastern box turtles and vernal pool species (marbled and blue-spotted salamanders [*Ambystoma opacum, A. laterale*], Blanding's turtles [*Emydoidea blandingii*]) could continue to decline as a result of these indirect effects.

In summary, federal and state laws and regulatory programs protect threatened or endangered species and certain habitat types. Regulatory protections prevent long-term adverse impacts to listed species. Because the MESA process requires net benefit measures for all projects, there would not be continued losses of listed species under the No-Build Alternative. As previously described, indirect effects on habitat quality and connectedness would be greater under Scenario 1 for the Build Alternatives, and would be reduced in Scenario 2 to levels below the No-Build Alternative.

5.4.6 Water Quality

Surface water quality is regulated by the USEPA under Section 402 of the CWA. Relevant CWA programs include the National Pollutant Discharge Elimination System (NPDES) (which regulates discharges of wastewater and storm water to certain surface water bodies), and the Total Maximum Daily Load program (regulating discharges of pollutants into certain water bodies with designated uses; this program has been delegated to DEP). Most construction-related discharges are subject to EPA's Construction General Permit, which requires a Stormwater Pollution Prevention Plan, among other requirements.

Surface water resources are protected at the state level under several laws and regulatory programs, including the Massachusetts Clean Waters Act (MCWA). Other applicable rules, regulations, and guidance include the Massachusetts Wetlands Protection Act and Wetlands Protection Act Regulations, Massachusetts Public Waterfront Act and Waterways Regulations, the Surface Water Quality Standards, the proposed Stormwater Management Regulations, and the Massachusetts Stormwater Management Handbook.

As with other physical resources (such as biodiversity and wetlands), water quality in the South Coast region has been adversely impacted by historical activities but increasingly stringent federal and state regulatory controls over the past several decades have resulted in substantive improvements. Many surface water bodies and groundwater resources have been classified for specific uses and are protected for those uses. Point source and non-point source discharges to surface water bodies are regulated, and special protections are afforded to either outstanding resource waters (those with exceptional values) or impaired waters (those that do not meet standards for their designated use). Groundwater supply protection areas have been similarly established to protect aquifers that are used for public water supplies. Chapter 4.17, *Water Resources*, provides a summary of the relevant regulatory programs and designations for each classified water resource in the South Coast Rail study area.

All potential sources of discharges to surface water bodies or groundwater resources must comply with relevant regulatory requirements. Accordingly, none of the reasonably foreseeable future actions listed above would result in a decrease of surface or groundwater quality.

The South Coast Rail project would not adversely impact water quality. The project would not require any process water discharges, and storm water discharges from the railroads, stations, or layover facilities would be managed in compliance with a Storm Water Pollution Prevention Plan (SWPPP) and state stormwater standards. With the required mitigation and drainage features in place, the Build Alternatives are not expected to contribute contaminants that would impair surface or groundwater resources (Chapter 4.17, *Water Resources*).

Development could indirectly affect water quality through nonpoint sources such as runoff from lawns (containing fertilizers, herbicides or pesticides). An increased number of septic systems in municipalities without sewer and wastewater treatment could also affect groundwater quality through the addition of nutrients, potentially increasing eutrophication in surface water bodies. As previously documented, there would be minor differences between the No-Build Alternative and the Build Alternatives under Scenario 1. Each of these could result in indirect effects to surface or groundwater quality. Although not quantifiable at this phase of project design, it is anticipated that land development under Scenario 2 would result in less pavement, due to cluster development, and less stormwater runoff than Scenario 1. Development in Scenario 2 is also anticipated to reduce lawn area, and would therefore have a slight reduction in potential indirect water quality effects. Therefore, Scenario 2 is anticipated to reduce cumulative water impacts over the No-Build Alternative and Scenario 1 of the Build Alternatives.

5.4.7 Air Quality

This section discusses the cumulative impacts of the South Coast Rail project to ambient air quality and GHG emissions. As discussed in Chapter 4.9, *Air Quality*, hazardous air pollutant emissions from mobile sources are not anticipated to be a substantial aspect of the South Coast Rail project and are therefore not discussed in this analysis.

Air quality in Massachusetts is regulated by the EPA within various programs of the federal Clean Air Act and by MassDEP under the Massachusetts Clean Air Act and the Global Warming Solutions Act. Certain projects must be evaluated for impacts to ambient air quality, GHG emissions, and hazardous air pollutant emissions. Controls or offsets of these emissions are often required as part of facility operating permits. States are required to develop and implement plans to improve ambient air quality when thresholds are exceeded for certain pollutants.

5.4.7.1 Ambient Air Quality

The existing ambient air quality in the South Coast region reflects past actions and regulatory controls. The USEPA regulates emissions of six "criteria pollutants" under the National Ambient Air Quality Standards (NAAQS) program.[50] The USEPA has designated all three South Coast counties (Bristol, Norfolk, and Plymouth)[51] as in non-attainment status for ozone NAAQS but in attainment status for all other criteria pollutants.[52] MassDEP has prepared a State Implementation Plan (SIP) describing how the

[50] USEPA. 2009. *Six Common Air Pollutants*. EPA website: http://www.epa.gov/air/urbanair. Accessed on 25 September 2009.
[51] The entire state does not meet the ozone NAAQS.
[52] USEPA. 2009. County Air Quality Report- Criteria Pollutants, Geographic Area: Massachusetts, Year: 2008. USEPA website: http://iaspub.epa.gov/airsdata/adaqs.summary?geotype=st&geocode=MA&geoinfo=st%7EMA%7EMassachusetts&year=2008&fld=county&fld=stabbr&fld=regn&rpp=25. Accessed on 25 September 2009.

ozone NAAQS will be met by the end of the 2009 monitoring season.[53] MassDEP projections were made with a model that takes into consideration state and county growth factors.

Air quality monitoring shows a recent trend of decreasing volatile organic compounds (VOCs) and nitrogen oxides (NO_x) emissions (in the presence of sunlight and heat, VOCs and NO_x react to form ozone). New federal rules on emissions and fuel standards for non-road mobile sources (such as locomotives), as well as regulations on numerous other source products, will contribute to these anticipated reductions.

The electrification of the Northeast Corridor reduced diesel locomotive usage, resulting in lower emissions of air pollutants, and likely beneficially impacting ambient air quality.

The construction of proposed industrial, business, or commercial parks in Fall River and Freetown, and at Great Woods in Mansfield would increase automobile traffic, resulting in more emissions of air pollutants than if these projects were not built. However, none of these projects would result in exceeding NAAQS. Even with these projects ambient air quality is expected improve over the current conditions due to increasing regulatory controls.[54] Although traffic would be increased, regulatory controls such as federal automobile emission standards and state vehicle inspection programs would reduce emissions.

The South Coast Rail project would not adversely impact ambient air quality. None of the alternatives would result in exceeding any of the NAAQS for the six criteria pollutants (Chapter 4.9, *Air Quality*). There is less than one-tenth percent variation in emissions between the alternatives, including either electric- or diesel-powered train options of the Build Alternatives.

Ambient air quality in 2035 would be improved over current conditions, even with the projected growth in the region, due to both regulatory controls and the reduced rate of growth in traffic that would result from use of the transit system. The South Coast Rail project is expected to beneficially impact air quality indirectly. Compared to the No-Build Alternative, vehicular movements (in terms of VMT) under the Build Alternatives would be reduced by up between 197,500 and 252,200 VMT daily, with resultant reduction in emissions of regulated air pollutants (see Table 5.3-9).[55]

There would be no significant difference in ambient air quality cumulative impacts under the No-Build and Build Alternatives.

5.4.7.2 Greenhouse Gases

GHG monitoring at the federal level has been conducted since 1990, and the U.S EPA recently initiated a program regulating GHGs for large sources.[56] The most recent data available are from 2007 and, compared to 1990 data, indicate that total national GHG emissions have increased by 17 percent over

[53] DEP. 2008. *Final Massachusetts State Implementation Plan to Demonstrate Attainment of the National Ambient Air Quality Standard for Ozone*. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection: Boston.

[54] US DOT. 2009. Route 24, Fall River and Freetown, Massachusetts, Access Improvements Project,; Environmental Assessment, Draft Individual Section 4(f) Evaluation, and Final Environmental Impact Report. US Department of Transportation, Federal Highway Administration and Commonwealth of Massachusetts, Massachusetts Highway Department: Cambridge and Boston, MA.

[55] Ibid.
See in particular Table 5-1, Summary of 2030 Mesoscale (Regional) Air Quality Analysis for South Coast Rail Project.

[56] USEPA. 2009. Final Mandatory Reporting of Greenhouse Gases Rule. USEPA website: http://www.epa.gov/climatechange/emissions/ghgrulemaking.html. Accessed on 25 September 2009.

those 17 years.[57] GHG emissions attributed to transportation sources principally from fossil fuel consumption increased 27 percent over the same time period (an average of 1.6 percent per year).

At the state level, GHG emissions in 1990 have been used as a baseline to establish projections to 2020.[58] GHG reduction targets are to be developed for each decade from 2020 to 2050,[59] beginning with a target between 10 and 25 percent reduction (as compared to 1990 levels) and culminating in at least an 80 percent reduction by 2050.[60] The 1990 data indicate that GHG emissions attributable to transportation sources were 28.9 million metric tons of carbon dioxide equivalent ($MMTCO_{2e}$). Lacking current state-specific data of GHG emissions but assuming that the nation-wide increase in transportation GHG emissions are similarly increasing at the state level, approximately 36.7 $MMTCO_{2e}$ were emitted by the transportation sector in Massachusetts in 2007. It is not possible to predict what either the regulatory limit for nor what the actual rate of GHG emissions may be in 2035.

The EPA's recent rule requiring reporting of GHG emissions applies to large GHG emission sources: facilities that emit more than 25,000 metric tons of carbon dioxide per year. Numerous other EPA regulatory programs are addressing greenhouse gas emissions from other sources, including vehicle emission standards for heavy-duty vehicles,[61] and standards for 2017-2025 model year cars and trucks adopted in 2012.[62]

The construction of proposed industrial, business, or commercial parks in Fall River, Freetown, and Mansfield will likely contribute GHGs into the atmosphere due to increased VMT. For example, the Crossroads at 24 project in Fall River is required to conduct mesoscale air quality analyses for VOC and NO_x emissions for compliance with MassDEP's Greenhouse Emissions Policy and Protocol. As with the ambient air quality, this project would result in GHG emissions but modeled air pollutant concentrations in the future (2035) are lower than current concentrations due to increasing regulatory controls.[63]

The South Coast Rail project would result in direct and indirect GHG emissions. Although all project alternatives (including the electric- or diesel-powered train options) would result in direct GHG emissions, the modeled emissions are less than would occur under the No-Build Alternative (Chapter 4.9, *Air Quality*). Automobile traffic (VMT) would be reduced, with resultant comparative reduction in GHG emissions (Chapter 4.9, *Air Quality, Table 4.9-20: Summary of the 2030 Mesoscale (Regional) Air Quality Analysis for the South Coast Rail Alternatives)*.

The South Coast Rail project would result in GHG emissions from induced growth. Table 5.4-8 compares the calculated direct and indirect transportation-related, as well as residential growth, 2035 GHG emissions for each alternative from the Business as Usual scenario.

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[57] USEPA. 2009. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007*. US Environmental Protection Agency: Washington, DC.

[58] DEP. 2009. *Statewide Greenhouse Gas Emission Level: 1990 Baseline and 2020 Business As Usual Projection*. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection: Boston.

[59] MA DEP. 2009. *Air & Climate: Greenhouse Gases & Climate Change, What the State is Doing: Global Warming Solutions Act*. Website: http://www.mass.gov/dep/air/climate/index.htm#gwsa. Accessed 12 October 2009.

[60] DEP. 2009. *Statewide Greenhouse Gas Emission Level: 1990 Baseline and 2020 Business As Usual Projection*. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection: Boston.

[61] Available online at: http://www.epa.gov/otaq/climate/regs-heavy-duty.htm.

[62] Available online at: http://www.epa.gov/otaq/climate/documents/420f12051.pdf

[63] US DOT. 2009. Route 24, Fall River and Freetown, Massachusetts, Access Improvements Project,; Environmental Assessment, Draft Individual Section 4(f) Evaluation, and Final Environmental Impact Report. U.S. Department of Transportation, Federal Highway Administration and Commonwealth of Massachusetts, Massachusetts Highway Department: Cambridge and Boston, MA.

The data suggest a very minor change from the No-Build Alternative in greenhouse gas emissions that would directly or indirectly result from the South Coast Rail project. Fewer miles would be traveled for all alternatives, offsetting the growth in the number of households for each alternative.

Table 5.4-8 Greenhouse Gas Emissions in 2035

Historical Trends affecting Greenhouse Gas Emissions	Trends and Current or Future Actions affecting Greenhouse Gas Emissions	Alternative	Greenhouse Gas Emissions (CO_2 tpy)			
			Project Direct and Indirect Effects	GHG Emissions in 2035	Change from No-Build	% Change from No-Build
Increasing greenhouse gas emissions	Decreasing greenhouse gas emissions due to new state and federal controls despite additional sources	No-Build	N/A	28,691,855	N/A	N/A
		Build Alternatives				
		Scenario 1				
		Stoughton	33,168	27,842,309	-849,546	2.9
		Whittenton	33,168	27,842,309	-849,546	2.9
		Scenario 2				
		Stoughton	<33,168	<27,842,309	>-849,546	>2.9
		Whittenton	<33,168	<27,842,309	>-849,546	>2.9

Note: Assumes 11.83 CO_2 tpy for all alternatives.

The cumulative impacts evaluation combines the historical activities, regulatory controls, and reasonably foreseeable future actions with the greenhouse gas emissions that are anticipated from the South Coast Rail project. As with ambient air quality, within Scenario 1 greenhouse gas emissions in 2035 would be improved over current conditions for all alternatives, even with the anticipated growth in the region, due to both the regulatory controls and the reduced rate of growth in traffic that would result from use of the transit system. It is not possible to predict the greenhouse gas emission level limits that may arise from the regulations mentioned above; it is only known that the limits will be some percentage lower than the 1990 emission levels. In any case, compared to the No-Build Alternative, automobile traffic (in terms of VMT) would be reduced, with resultant reduction in emissions of greenhouse gases, as presented in Chapter 4.9, *Air Quality, Table 4.9-20: Summary of the 2030 Mesoscale (Regional) Air Quality Analysis for the South Coast Rail Alternatives*. The increase in households would, of course, increase associated greenhouse gas emissions over the No-Build Alternative. In either case, however, greenhouse gas emissions will be cumulatively reduced because of the regulatory requirements to reduce greenhouse gas emissions as compared to 1990 levels.

Scenario 2 is anticipated to reduce greenhouse gas emissions but the reductions may not be measurable at the regional level. As shown in Table 5.2-2, there would be no measurable difference in greenhouse gas emissions by household within Scenario 2. The location of the sources would differ (i.e., concentrated in PDAs instead of dispersed throughout the region) but the total emissions from stationary sources would not. Sprawl would be reduced, as compared to Scenario 1, because development would be concentrated close to station sites and in PDAs, presumably resulting in less personal car use and therefore lower greenhouse gas emissions.[64]

[64] EOT. 2009. *Smart Energy/Smart Growth Toolkit: Transit-Oriented Development (TOD)*. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works website: http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-tod.html. Accessed 25 September 2009.

As described in Section 5.3, forest clearing would likely reduce carbon sequestration, but cannot be quantified at this time. Changes in carbon sequestration would be proportional to the amount of land cleared for each alternative and scenario.

Combined with the improvements in greenhouse gas emissions required by regulatory standards described above, the cumulative impacts from the Build Alternatives would:

- Under Scenario 1, contribute additional GHG but, depending upon the alternative selected, at minimally lower or higher rates than the No-Build Alternative, or
- Under Scenario 2, also contribute additional GHG but, depending upon the alternative selected, at minimally lower or higher rates than the No-Build Alternative. The greenhouse gas emission source locations may vary, but the overall (regional) reduction as compared to the Business as Usual scenario may be immeasurable.

There would be no significant differences between the alternatives in the cumulative impacts to global climate change from greenhouse gas emissions.

5.4.8 Economy

The evaluation of potential project-induced impacts to economic conditions is typically a component of analyses conducted for federal and state agencies. Because governments are typically funded, in part, by taxes, tracking tax revenue streams often provides a good measure of the economy.

Local, state, and federal agencies monitor (measure) various economic metrics. As described in the Corridor Plan, the "South Coast rail alternatives will improve accessibility and mobility in the South Coast region, and these improvements are expected to stimulate additional business sales, jobs, household income, and state and local taxes beyond that forecast in the absence of such improvements."[65] This evaluation of the cumulative impacts to the economy that may result from the South Coast Rail project is based on projected impacts to households and population, economic activity and jobs, and tax revenues.

It is anticipated that economic impacts would be recognized at different locations across the South Coast region under Scenario 1 and Scenario 2 because the implementation of smart growth measures under Scenario 2 would distribute development differently than demonstrated under existing conditions and projected under Scenario 1.

5.4.8.1 Household Size and Population

As presented in Table 5.3-2, household growth in the South Coast region from 2000 to 2035 is anticipated to total 75,212 new households under the No-Build Alternative. Assuming an average household size of 2.5 persons, the resident population of the South Coast region would increase by approximately 188,031 persons by 2035 under the No-Build Alternative. Based on a regional population of approximately 740,000 in 20098, the South Coast region population would be approximately 928,031 in 2035 under the No-Build Alternative.

[65] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. See Chapter 5: Potential Economic Effects of South Coast Rail, and in particular Table 5-1: Economic Effects in 2030 of South Coast Rail (SCR) Rail Alternatives ($2007).

The Build Alternatives are projected to introduce an additional 2,802 to 2,804 households across the South Coast region by 2035. Assuming 2.5 people per household, this would result in an additional 7,005 to 7,010 people across the South Coast region over and above the No-Build Alternative. The incremental increase in population under the Build Alternatives represents less than 0.8 percent of the 2009 South Coast region population.

5.4.8.2 Jobs and Economic Activity

Extensive economic data characterizing the current economy are provided in the Corridor Plan.[66] Bristol County includes some three-quarters of the population and is almost entirely encompassed by the South Coast Rail study area (smaller portions of Plymouth and Norfolk counties are also within the project area). The employment base in Massachusetts grew by 53 percent between 1976 and 2006, while the Bristol County employment base grew by only 43 percent.[67] Seventy percent job growth was seen in Norfolk County and 109 percent in Plymouth County. The highest growth rates (statewide and in each county except Norfolk) were observed between 1981 and 1986, followed by negative growth (job loss) between 1986 and 1991.[68] With few exceptions, Bristol County experienced the least job growth (and greatest job loss) of the three South Coast counties over the 30-year period.

In the most recent period, total economic output in the South Coast Rail study area was over $50 billion in 2006, an increase of 18 percent from the 2001 output of $43 billion.[69] Grouping the broad range of industry sectors into four general types agricultural output represented 42.7 percent ($398 million), manufacturing represented 22.6 percent ($12 billion), services and trades represented 18.6 percent ($34 billion), and other production (mining, construction, and utilities) decreased represented 0.6 percent ($4 billion).

While economic output gained on average, the South Coast region lost 2,839 jobs during this period to total 374,832 in 2006, a decrease of less than 1 percent.[70] The greatest number of job losses was realized in the manufacturing sector, down from 51,833 to 40,633. This represents a nearly 22 percent loss but compares with state (23 percent) and national (21 percent) losses in the manufacturing sector in the same period. Job growth in sectors such as amusement & recreation, lodging, eating & drinking, wholesale trade, and real estate helped offset the shrinking of the manufacturing sector. The Corridor Plan estimates that there are currently 380,000 jobs the South Coast region.[71]

A number of the reasonably foreseeable future activities, as well as some more speculative projects, would introduce new economic activity and job in the South Coast region:

[66] Ibid.

[67] Ibid. See in particular Appendix E: Baseline Report: Economic Development and Land Use Conditions in the South Coast Region Today, Chapter IV Economic Development Baseline.

[68] Ibid. See Appendix E: Baseline Report: Economic Development and Land Use Conditions in the South Coast Region Today, Chapter IV Economic Development Baseline, Figure 40: Employment Changes, 1976-2006.

[69] Ibid. See Appendix E: Baseline Report: Economic Development and Land Use Conditions in the South Coast Region Today, Chapter IV Economic Development Baseline, Table 25: Trends 2001-2006.

[70] Ibid. See Appendix E: Baseline Report: Economic Development and Land Use Conditions in the South Coast Region Today, Chapter IV Economic Development Baseline, Table 22: Employment Changes by Sector, 2001-2006.

[71] Ibid. See Chapter 5, Potential Economic Effects of the South Coast Rail.

- The proposed industrial, business, or commercial parks in Fall River and Freetown would increase business activity and add 11,000 jobs in these two communities[72] once the parks are occupied.

- Numerous other ongoing or anticipated developments throughout the South Coast, as outlined in the Corridor Plan,[73] are projected to increase business activity and add jobs in the region.

Many of these projects fall within the Southern Triangle portion of the South Coast Rail study area, therefore, the cumulative impacts would not differentiate between the Build Alternatives.

Historic and current data suggest that overall economic growth will continue in the South Coast region at a rate similar to the state as a whole. However, growth (or loss) will vary substantively between industries and communities and likely fluctuate during different time periods as a result of overall economic conditions. In general, economic activity is greatest in the northernmost communities (those closer to Boston) and communities already serviced by rail (such as the Northeast Corridor). Using the two geographic divisions described in the indirect effects analysis, the Corridor Plan predicts $52 billion in business activity in SCR 10 and $27 billion in SCR 21, for a total business output of $99 billion in 2030 under the No-Build Alternative.[74] The Corridor Plan does not analyze potential impacts in 2035.

Economic benefits would be recognized across the South Coast region during both the construction and operation of the Build Alternatives. Based upon the preliminary estimates of construction costs, the Corridor Plan states that "expenditures for labor and materials would generate construction period benefits of about 7,000 to 8,000 jobs, $1.4 to $1.8 billion in business output, and about $315 to $360 million in household income."[75] The Corridor Plan does not assign these impacts to individual communities or distinguish between the alternatives. By 2035, recognized economic benefits as a result of the South Coast Rail project are expected to contribute between $268 and $295 million in net new business output annually within the South Coast region and an additional $180 million to $192 million for the rest of the state.[76]

As described in Chapter 4.3, *Socioeconomics*, some job losses are anticipated as a result of business displacements to support the Build Alternatives, specifically at the Fall River Depot Station. The extent of such losses would depend on whether business owners relocate in the area. The size and number of businesses that would be displaced is not anticipated to affect overall municipal tax revenue in any significant way.

An additional 37,864 jobs would be introduced to the South Coast region by 2035 under the No-Build Alternative. This number is over and above the 380,000 estimated jobs in the Corridor Plan. Under Scenario 1 of the Build Alternatives, projections indicate an additional 1,341 jobs would be introduced to the South Coast region by 2035. Two fewer jobs would be introduced to the region under Scenario 2

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[72] Pateakos, J. 2009. Grants for Executive Park to be unveiled. Herald News (April 3, 2009) website: http://www.heraldnews.com/homepage/x180623384/Grants-for-Executive-Park-to-be-unveiled. Accessed 13 October 2009.

[73] EOT. 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. See in particular Appendix E: Baseline Report: Economic Development and Land Use Conditions in the South Coast Region Today, Chapter IV Economic Development Baseline. See in particular Chapter 6: Elements of the Corridor Plan.

[74] EDR Group. 2009. Basic Economic Variables. Economic Data Research Group: Boston.

[75] Ibid. Pg.9.

[76] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. Pg. 9.

than Scenario 1. An additional 1,200 to 1,260 jobs are estimated to result from the South Coast Rail project but occur elsewhere in the state.

Similar to population projections, economic activity and the job market are not expected to change on the regional level with the implementation of smart growth initiatives under Scenario 2. Locally, businesses may choose sites close to stations or municipalities with implemented smart growth measures such as TOD as compared to those that do not. However, it is not possible to project such fine-scale economic activity changes under Scenario 2.

5.4.8.3 Tax Revenue

The Corridor Plan identifies per-capita property tax receipts for selected South Coast communities in 2006.[77] These data indicate that tax receipts for communities that currently do not have train service (Fall River, New Bedford, and Taunton) are lower than for communities that currently do have train service (Attleboro, Foxborough, and Sharon).

Potential direct economic impacts from the Build Alternatives are outlined in Chapter 4.3, *Socioeconomics*. The analysis concludes that direct property tax revenue losses as compared to the total property tax receipts in affected municipalities would be minimal. Property acquisitions (converting privately owned parcels to publicly owned, thereby eliminating the property tax generated) would be minimal, and few business or residential displacements would result from the Build Alternatives.

Indirectly, property values are expected to increase near station sites due to increased access to transit but decrease along the Build Alternative alignments due to increased noise levels from train operations. It is assumed that residential property values would increase by 5 to 25 percent for residences within 1 mile of new station sites and decrease by up to 20 percent within about 400 feet of the alignments or layover facilities. It is not possible to predict with any precision the property tax revenue changes that may result for each community.

The Corridor Plan indicates that, under Scenario 1, the Build Alternatives would indirectly generate between $16 million and $18 million in net new state taxes and $8.5 million to $9.5 million in net new local business property taxes each year by 2030 as compared to the No-Build Alternative.[78] The expected changes for the Build Alternatives are not attributed separately. The Rapid Bus Alternative would generate approximately 60 percent of these values. The estimated overall growth (forecast regional growth plus growth attracted to station sites and new induced growth) near rail stations would result in $62 million to $77 million in local property taxes.[79] The Corridor Plan provides estimates through 2030.

The implementation of smart growth measures under Scenario 2 is expected to change the location of economic impacts such as property tax revenue sources in some South Coast study area communities, but is not expected to change overall (regional) impacts as compared to Scenario 1.

[77] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. See Appendix E: Baseline Report: Economic Development and Land Use Conditions in the South Coast Region Today, Chapter IV Economic Development Baseline, Figure 36: Per Capita Property Tax Receipts (All) 2006.

[78] EOT. 2009. *South Coast Rail Economic Development and Land Use Corridor Plan.* Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. See Chapter 5, Potential Economic Effects of South Coast Rail.

[79] Ibid. See in Table 5-2, Estimated Growth Near SCR Commuter Rail Stations by 2030.

5.4.8.4 Summary of Cumulative Economic Impacts

Combining the historic trends in the economy, recent or reasonably foreseeable future actions, and the varying effects on the economy that would result from the Build Alternatives, cumulative impacts of the South Coast Rail alternatives to the economy in 2035 for each alternative under the two scenarios are listed in Table 5.4-9.

The Build Alternatives would measurably benefit the economy in the South Coast region, with actual benefits at the municipal level distributed; the distribution of which would depend on whether smart growth measures are implemented. In all cases, the incremental addition of the project's economic benefit to the regional economy would be insubstantial; the cumulative effect of any of the alternatives would be a minimal change to any of the economic parameters.

Local effects would vary considerably, particularly in communities with transit stations. However, cumulative impacts even at the local level would be minimal because new residential development under the Build Alternatives would represent only a small fraction of total households in each municipality.

Table 5.4-9 Cumulative Impacts to the Economy in 2035

Historical Trend Affecting the Economy	Trends and Current or Future Actions Affecting the Economy	Economic Conditions in 2035				New Tax Receipts (2030)*	
		Alternative	Population	Jobs	Economic Activity (2030)*	Municipal	State
Recent growth in economic activity but slower growth in job market; geographic differences north-to-south	Global economic downturn; planned commercial and industrial developments in Southern Triangle 380,000 current jobs with 1.4 % per year growth	No-Build	928,031	417,864	$99B	N/A	N/A
		Build Alternatives					
		Scenario 1	935,041	419,205	$99.479B	$8.5-9.5M	$16-18M
		Scenario 2	935,036	419,203	$99.479B	$8.5-9.5M	$16-18M

* The Corridor Plan only includes projections through 2030.

5.4.9 SUMMARY OF CUMULATIVE IMPACTS

Table 5.4-10 summarizes the incremental changes to the evaluated resources from the South Coast Rail alternatives that, in combination with past activities or trends and other known current and future projects, would potentially result in a substantive cumulative effect. The comparison is provided for both scenarios for the three alternatives considered in this evaluation, in relationship to the status of these resources under the projected No-Build Alternative conditions in 2035. Because there is no substantive difference between the impacts from Build Alternatives' electric- or diesel-powered trains, these options are not included in this summary comparison.

Table 5.4-10 Summary of Incremental Cumulative Changes between Alternatives

	Resource					
	Land Use	Wetlands	Biodiversity	Protected Open Space	Air Quality	Economy
No-Build Alternative	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 928,031
	308,371 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	116,675 acres of decreased habitat quality in 2035	64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 75,212
		124,748 acres of wetlands remaining in 2035	307,813 acres of natural land remaining in 2035		28,691,855 tpy CO_2 emissions in 2035	Jobs: 417,864 Business Activity: $99B Tax Revenue: N/A
Stoughton Alternative Scenario 1	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	307,030 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	120,605 acres of decreased habitat quality in 2035	64,794 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,756 acres of wetlands remaining in 2035	303,883 acres of natural land remaining in 2035		27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)
Whittenton Alternative Scenario 1	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	307,045 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	120,595 acres of decreased habitat quality in 2035	64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels	Households: 78,016

	Resource					
	Land Use	Wetlands	Biodiversity	Protected Open Space	Air Quality	Economy
Stoughton Alternative Scenario 2					by 2050	
Stoughton Alternative Scenario 2		124,754 acres of wetlands remaining in 2035	303,893 acres of natural land remaining in 2035		27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)
Stoughton Alternative Scenario 2	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	315,583 to 319,259 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	58,760 to 75,021 acres of decreased habitat quality in 2035	>64,794 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016
		124,759 to 124,760 acres of wetlands remaining in 2035	349,467 to 365,728 acres of natural land remaining in 2035		<27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)
Whittenton Alternative **Scenario 2**	Conversion of 1,315 acres per year	No net loss policy	22 acres of land converted per day	Protected at average rate of 383.7 acres per year	Trend of increasing GHG emissions counteracted by new regulatory requirements	Population: 935,040
	315,598 to 319,274 acres of undeveloped land remaining in 2035	Mitigation ratios of 1:1 to 3:1	58,750 to 75,011 acres of decreased habitat quality in 2035	>64,795 acres of open space remaining in 2035	CO_2-equivalent emissions to be 80% of 1990 levels by 2050	Households: 78,016

	Resource					
	Land Use	Wetlands	Biodiversity	Protected Open Space	Air Quality	Economy
		124,757 to 124,758 acres of wetlands remaining in 2035	349,477 to 365,738 acres of natural land remaining in 2035		<27,842,309 tpy CO_2 emissions in 2035	Jobs: 419,206 Business Activity: $99.5B Tax Revenue: +$8.5-9.5M (municipal) +$16-18M (state)

Table 5.4-10 shows that, in comparison to the No-Build Alternative, the Stoughton and Whittenton Alternatives would not have an adverse cumulative impact on the evaluated resources. There would be only minor differences in the cumulative effects of the Stoughton and Whittenton Alternatives, attributable to the minor differences in direct effects. For many resources, the cumulative impacts of Scenario 1 represent an insubstantial change from the conditions that would exist under the No-Build Alternative. In general, the cumulative effects of either alternative would be beneficial, depending on the extent of implementation of Smart Growth measures.

5.5 IMPLEMENTATION OF THE SOUTH COAST RAIL ECONOMIC DEVELOPMENT AND LAND USE CORRIDOR PLAN

This section of the FEIS/FEIR was prepared in response to comments on the DEIS/DEIR in regard to the South Coast Rail Long-Term Smart Growth Evaluation and Environmental Stewardship Plan. The Secretary's Certificate directed MassDOT to consult with the Interagency Coordinating Group (ICG) to develop a long-term evaluation and monitoring plan for the anticipated environmental and smart growth benefits of the South Coast Rail project. Specifically, the Secretary's Certificate stated that MassDOT should explore existing models and performance metrics used to evaluate the effectiveness of smart growth plans and environmental protection strategies, and include a summary in the FEIR of experience from other regions that may be useful to apply in the case of this project. In addition, the Secretary's Certificate directed MassDOT to work with the Massachusetts Executive Office of EEA, the ICG, RPAs, and local communities to develop evaluation indicators and metrics tailored to the South Coast Rail project. The Secretary's Certificate required the FEIR to propose a mechanism for periodic reporting out to the public and other agencies on MassDOT's progress in achieving smart growth and environmental goals of the project, including its commitments to protection of ecologically significant habitat.

This section provides MassDOT's literature review of smart growth monitoring and indicators/metrics, proposes a series of smart growth performance metrics appropriate for the South Coast Rail Corridor Plan and a method for reporting out on the performance metrics for the long-term term plan. Note that the implementation of the Corridor Plan is not required by the USACE.

5.5.1 Literature Review

As directed in the Secretary's Certificate on the DEIS/DEIR for the South Coast Rail project, existing plans smart growth and monitoring programs from across the United States were identified and reviewed for applicability to the proposed project. The purpose of the review was to identify metrics or indicators that may be used to evaluate implementation of the Corridor Plan with respect to PDAs, the PPAs, and the Station Areas. A total of five existing plans/programs were reviewed; three in depth including interviews, and two based on a review of existing, readily available materials. Detailed information on the plans/programs reviewed is provided in Appendix 5.5-A.

A significant difference between the plans and programs review and the South Coast Rail project is that there is no legislative mandate in Massachusetts that controls growth through the planning process. However, this does not mean that the goals and objectives of the Corridor Plan cannot be implemented; only that participation by the local communities would be voluntary rather than compulsory. Data collection to support the metrics and indicators would be accomplished through cooperation between state agencies, RPAs, and local governments.

A number of commonalities were evident in the literature review and subsequent interviews. Data were typically collected every two years. In the case of SANDAG's RCP monitoring, the SANDAG staff had begun by collecting and reporting data every year. Collecting and reporting on the RCP progress every year became an extremely staff- and time-intensive task prompting SANDAG to revise the reporting timeframe to every two years. As noted by other interviewees, reporting every year will not show any major trends. Change happens slowly and therefore, the performance metrics or evaluation indicators chosen should be descriptive without being overly complicated or too simplified. A number of well-developed metrics or indicators under a high level category may be needed to describe trends as illustrated by the large number of measures used by SANDAG and the PSRC for their VISION 2040.

Many of the metrics and indicators reviewed are simple metrics that could be reported with numbers. Others are more complex to report. Through the interviews completed, it was clear that metrics and indicators that reveal the performance trends without being too complex or overly simplistic are ideal. Similarly, data that are readily available is the simplest way to track metrics and indicators. The U.S. Census Bureau was often used due to the large amounts of data that are collected. In the case of the San Diego's Regional Comprehensive Plan and the Puget Sound Regional Council's VISION 2040 and Growing Transit Communities, the RPAs were the source of the data used to fulfill the metric or indicator. Other government agencies, and in very few cases, independent entities outside of the government, supplied data as well.

5.5.2 Performance Metrics

5.5.2.1 Methodology

To develop the performance metrics, MassDOT reviewed the *Corridor Plan*, the Secretary's Certificate and comments on the South Coast DEIS/DEIR relevant to smart growth, and Executive Order 525. Through internet searches, MassDOT identified regional plans and implementation reports/performance metrics that had similarities to the smart growth development goals envisioned for the South Coast region. Interviews were conducted with the RPAs charged with the implementation and reporting of performance metrics.

- Performance metrics were reviewed and prioritized using the following criteria:
- Performance metrics that were specifically identified in the Secretary's Certificate.
- Applicability of performance metrics to the smart growth goals and strategies identified in the *Corridor Plan*.
- Ease and availability of data for regular data collection. With a few exceptions, performance metrics with identifiable data sources were included such as U.S. Census data.
- Screening and the identification of additional performance metrics with the RPAs and state agencies that would be responsible for the tracking and monitoring component of this program.
- Screening and the identification of additional performance metrics from the ICG Smart Growth Working Group.

- Verification and alignment of performance metrics with data already collected under Executive Order 525 by state and RPAs.

- Directly or indirectly attributable to the successful implementation of the *Corridor Plan.*

After performance metrics were identified and refined, a plan for monitoring and reporting the metrics was drafted. The Evaluation Plan identifies the agencies responsible for data collection and reporting as well as recommendations on the distribution/reporting to the public to document Smart Growth progress within the South Coast region as a result of the implementation of the *Corridor Plan*.

The performance metrics identified in this Evaluation Plan are those that can be directly or indirectly attributable to the successful implementation of the *Corridor Plan* and not to the addition of South Coast Rail to the region. Performance metrics related to the South Coast Rail project as a whole were considered, but ultimately not included in the Evaluation Plan. For example, the potential economic benefits of the South Coast Rail project to the region are well-documented in the FEIS/FEIR and the project is projected to bring increased economic activity and access to new jobs. However, these economic benefits are not in themselves attributable to smart growth development and could be anticipated as a result of the South Coast Rail project with or without smart growth. The Evaluation Plan does include an employment-related performance metric but it is focused on TOD because it reports on the jobs within 0.5 mile of a transit station.

5.5.2.2 South Coast Rail Corridor Plan Performance Metrics

The performance metrics developed for the South Coast Rail project include metrics under a number of categories as described further below. According to the Secretary's Certificate, "the evaluation plan should include a monitoring component to assess the accuracy of impact projections and allow for mid-course corrections and adaptive strategies as needed." The performance metrics associated with impacts are Metrics 2 through 5 in Table 5.5-1.

EIS/EIR and General Metrics

According to the Secretary's Certificate, "the evaluation plan should include a monitoring component to assess the accuracy of impacts projections and allow for mid-course corrections and adaptive strategies as needed." These metrics assess impacts such as growth projections, as well as forestland, farmland and wetland impacts that were projected in the FEIR/FEIS for the business-as-usual and smart-growth scenarios with the actual impacts to these resources. The impacts associated with these scenarios would vary depending on the level of implementation of the *Corridor Plan*. The Evaluation Plan compares predicted impacts with actual impacts to assess the success of the *Corridor Plan*. MassDOT would collect data so that it may notify other state agencies and municipalities that have the ability to make "corrections and adaptive strategies" as required by the Secretary's Certificate.

Priority Development Area Metrics

PDA performance metrics are applicable to encouraging growth and higher density development in the 33 PDAs identified in the *Corridor Plan*. There is also one combined PDA/PPA. The PDAs are areas with the greatest capability or potential to accommodate new development, including downtowns, major job centers, and future South Coast Rail station areas. These metrics gauge the results of the *Corridor Plan* on PDAs, such as state investments in infrastructure with PDAs and development density within PDAs.

Transit Oriented Development Metrics

Transportation Oriented Development metrics are applicable to encouraging appropriate development, as well as bicycle and pedestrian infrastructure within the planned Station Areas and within up to 0.5 to 1 mile radius of the station. TOD emphasizes "compact, generally mixed-use development at or near transit stops whose design encourages walking and transit use."[80] The boundary for a TOD district is generally defined to be within 0.25 to 0.5 mile of the Transit Station.[81] The South Coast Rail metrics for TOD are generally defined as within 0.5 mile of a station.

Conservation and Priority Preservation Area Metrics

The Conservation and PPA Metrics are applicable to monitoring the permanent preservation of land within the 72 PPAs (in addition, there is one combined PDA/PPA). PPAs include land or environmental resources that are not permanently protected but are worthy of increased levels of protection through planning, regulation, conservation or acquisition.

Social Equity Metrics

These metrics would be used to monitor the social equity benefits of the *Corridor Plan*. The *Corridor Plan* specifically mentions the Chapter 40B and inclusionary zoning as possible tools that municipalities can use to implement housing-related regulatory policies to direct development towards PDAs. The performance metrics are focused on the provision and planning of affordable housing within PDAs and station areas because it is assumed that the availability of affordable housing near station areas will result in increased access to jobs, medical care, and educational opportunities for low to medium income households. In addition, the provision of affordable housing will also help to moderate the effects of gentrification close to station areas. It should be noted that these metrics are focused on the success of the Corridor Plan to advance social equity, and not on the effects of new public transit services which are also expected to provide benefits to under-served minority and low-income populations.

5.5.2.3 Performance Metrics Data Collection

Performance metric data sources should be readily available data and, if possible, data that is already routinely collected. As such, the data sources for the South Coast Rail performance metrics include the South Coast municipalities, the U.S. Census Bureau, the Massachusetts Executive Office of Administration and Finance (A&F) Database, and the MassGIS. Executive Order 525, which directed state agencies to make infrastructure and land protection investments consistent with the priority areas identified on the Corridor Map of the *Corridor Plan*, directed the Massachusetts Office of Administration and Finance to develop a web-based tracking tool, the Administration and Finance Database, which would track state agency investment in the South Coast region related to the goals identified in the *Corridor Plan*. Finally, MassGIS data has readily available state-wide GIS data that can be used in GIS-based analyses to document changes throughout the South Coast region.

While the majority of the performance metrics are available through reliable and regularly updated data sources, there are a number of exceptions to these including:

- Metric 2 - Actual and predicted loss of farmland by community;

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[80] Commonwealth of Massachusetts. South Coast Rail Economic Development and Land Use Corridor Plan. June 2009.
[81] Transit Cooperative Research Program. Transit-Oriented Development and Joint Development in the United States: A Literature Review. Number 52. October 2002.

- Metric 3 - Actual and predicted loss of wetlands by community; and
- Metric 4 - Actual and predicted loss of forestland by community.

There data were specifically requested by MEPA. Data for these metrics would be provided by MassGIS, however, the last updated GIS data were provided in 2004. Although it is not known when the GIS data would be updated, these metrics are included in the anticipation that the data would become available at some point during the 20-year monitoring period.

In addition to the MassGIS data, the VMT data, jobs, and housing and transportation affordability metrics are not currently regularly available for the South Coast region. These metrics include:

- Metric 5 - VMT for entire South Coast Region;
- Metric 21 - VMT per capita within 1 mile of station;
- Metric 22 - Total jobs within a 0.5 mile of station; and
- Metric 31 - Percent of household income spent on housing and transportation within 0.5 mile of station compared to region.

MAPC is currently working on a project to estimate annual mileage for every vehicle in the state, based on odometer readings during annual safety inspections, and to geocode the vehicles based on their registration address, and estimate fuel consumption and associated cost for each vehicle based on the mileage and EPA fuel efficiency ratings. The final product will be a “VMT Atlas.” MAPC has noted that these data could be available for the South Coast region and for station areas but that funding is not yet available to update the data on a regular basis.

Metrics 22 and 31 are currently proposed to be collected through the Center for Neighborhood Technology’s Transit Oriented Development Database (TOD database). CNT has developed the TOD database—a GIS platform that includes every fixed-guideway transit system in the United States and demographic and land use data for the half-mile radius around all 4,000 stations. This tool provides detailed information on the performance of TOD in metropolitan regions. The South Coast Region is not currently covered in the CTOD TOD database because these stations have not yet been constructed. Data collected for Metrics 22 and 31 using the TOD database are contingent on whether these stations and relevant data sources are added to the TOD database.

Although it is not confirmed that the data sources for these performance metrics would be regularly available, these metrics are included because there are no other readily available data sources for these metrics and they were noted to be of particular importance by the ICG Smart Growth Working Group.

Table 5.5-1 includes the proposed metric by title, the potential data sources, and suggested frequency of data collection based on the data source and ease of collection. These metrics were reviewed by the ICG Smart Growth Working Group (Executive Office of Housing and Urban Development, Massachusetts [EOHED], EPA, MassDEP, Executive Office of EEA, MEPA, USACE, and MassDOT) at meetings on April 26 and June 27, 2012, and revised based on the group’s feedback.

Table 5.5-1 South Coast Rail Proposed Performance Metrics

Topic	Indicator	Data Source	Frequency of Data Collection
EIS/EIR and General Metrics	1. Actual and predicted growth in the number of households by community	American Community Survey 5-Year Estimates at the Block Group Level	3 year
	2. Actual and predicted loss of farmland by community	MassGIS (as available)	3 year
	3. Actual and predicted loss of wetlands by community[1]	Local Conservation Commission agents, MassGIS (as available) and baseline, business-as-usual, and smart-growth scenarios from FEIR/FEIS and MassGIS	3 year
	4. Actual and predicted loss of forestland by community	MassGIS (as available)	3 year
	5. Vehicle miles travelled (VMT) for entire South Coast Region	MAPC (as available)	3 year
	6. State technical assistance to communities to implement *Corridor Plan* in dollars and type by community	A&F Spreadsheet	Annual
	7. Transfer of Development Rights (TDR) projects by municipality	Municipality	3 year
Priority Development Area Metrics	8. Housing units per acre within PDAs versus new housing units per acre outside of PDAs	American Community Survey 5-Year Estimates at the Block Group Level3	3 year
	9. New commercial/industrial square footage meeting or exceeding 10,000 sq. ft. in the PDAS and Commercial /Industrial square footage meeting or exceeding 10,000 sq. ft. outside PDAs in the South Coast Region[1]	A& F Spreadsheet3	Annual
	10. Type of new housing units located in PDAs: multi-family versus single family	American Community Survey 5-Year Estimates at the Block Group Level 3	3 year
	11. Number of municipalities with zoning revisions and type of zoning revisions supporting PDAs	A&F Spreadsheet4	3 year
	12. Permitting changes, such as expedited permitting under Chapter 43D, within PDAs	A&F Spreadsheet4	Annual
	13. Direct state investments and funding in PDAs (dollars)	A&F Spreadsheet3	Annual
	14. New state buildings and office leases in PDAs	A&F Spreadsheet3	Annual

Topic	Indicator	Data Source	Frequency of Data Collection
Transit Oriented Development Metrics	15. Number of municipalities that have adopted specific station area plans or have specific station area plans under development (total by municipality)	Municipality3	3 year
	16. Number of municipalities adopting parking management strategies within 0.5 mile of station	Municipality3	3 year
	17. Amount of new bike lanes provided by municipality	MassDOT and/or municipality	3 year
	18. Household density within 0.5 mile of station	Decennial U.S. Census and/or building permit data from municipality	10 year for decennial Census; 3 year for building permit data
	19. Mode share of commute to work within 0.5 mile of station	American Community Survey 5-Year Estimates at the Block Group Level	3 year
	20. Number of buildings that are LEED-Certified, developments using green building strategies and LEED for Neighborhood development Certified neighborhoods within Station Areas	U.S. Green Building Council, MAPC, Municipality[3]	3 year
	21. Vehicle-miles traveled (VMT) per capita within 1 mile of station	MAPC (as available)3	3 year
	22. Total jobs within 0.5 mile of Station	CNT TOD Database (as available). http://toddata.cnt.org/ Data derived from LED Work Area Characteristics.	3 year
Conservation and Priority Preservation Area Metrics	23. Number of municipalities creating open space plans and/or revising zoning ordinances to support PPAs (conservation subdivision bylaws such as cluster development or open space residential design bylaws) and how	Municipality (A&F Spreadsheet)4	3 year
	24. Number of land preservation projects by community	Municipality (A&F Spreadsheet)	3 year
	25. Percent and acreage of PPAs permanently protected	Executive Office of EEA	Annual
	26. Percent and acreage of PPAs developed	Executive Office of EEA	Annual
	27. Land preservation investment in PPAs	Executive Office of EEA	Annual

5.5.3 Monitoring and Reporting Program

This section describes MassDOT's proposed monitoring program for the *Corridor Plan* including the responsibilities for each state agency and RPA. The reporting program is also described in this section.

5.5.3.1 Current Monitoring Program

Currently Executive Order 525, described in Appendix 5.5-A, mandates policy commitments made in the *Corridor Plan* for "Strategic Investments" by committing the Commonwealth to use its discretionary grant funds and its investments to target technical assistance and infrastructure investments to priority areas, to the maximum extent feasible. The state programs that are under the purview of the Executive Order 525 are identified below according to responsibilities.

EOHED:

- MassWorks Grants
- Chapter 43D Expedited Permitting
- Brownfields Revolving Fund

Executive Office of Administration and Finance (A&F)/Department of Revenue (DOR)

- Brownfields Tax Credit
- Historic Tax Credit

Department of Housing and Community Development (DHCD):

- Economic Development Fund (component of the Community Development Block Grant Program)
- Economic Development Incentive Program
- Chapter 40R smart growth districts
- Chapter 40B housing developments
- Rental Round Assistance
- Housing Development Incentive Program

Division of Capital Asset Management (DCAM):

- Construction of new state buildings and new office leases

Executive Office of Energy and Environmental Affairs (Executive Office of EEA):

- Gateway City Parks
- PARC (formerly, Urban Self-Help)

- LAND (formerly, Self-Help)
- Land preservation programs at the Department of Fish and Game, Department of Agricultural Resources (Agricultural Preservation Restriction Program), Department of Conservation and Recreation, and Department of Environmental Protection
- Conservation Restrictions
- State Revolving Fund- clean and drinking water projects

MassDOT:

- Transportation Improvement Program projects
- Accelerated Bridge Program
- Non-Federal Aid transportation projects

MassDOT/EOHED:

- South Coast Rail Technical Assistance Program

The Executive Order requires annual reporting by directing A&F to develop a retrospective analysis to measure the consistency of state investment commitments with the *Corridor Plan* in addition to web-based tracking tool.[82] Over 245 state investment commitments, made between Fiscal year 2009 and Fiscal year 2011 in the South Coast Region, were reviewed as part of A&F's retrospective analysis.

As noted in the *Retrospective Report*[83], agencies have undertaken the following implementation actions to ensure compliance:

- Developing a strategic plan, by agency, for implementing the Executive Order, which will include considerations and issues raised in this report;
- Collecting data to report the implementation of the Executive Order by agency, which will be summarized in an annual report;
- Seeking approval from other agencies for investments that are inconsistent with the *Corridor Plan* (for example, the Executive Office of EEA would need to justify an exception to the EO 525 for land conservation in a PDA); and
- Targeting technical assistance and infrastructure investments to priority areas, to the maximum extent feasible.

In addition to the *Retrospective Report* and web based tracking tool, the Executive Order also directed A&F to collect and report state investment commitments each year in the region. These commitments

[82] Available online at: http://www.mass.gov/hed/economic/eohed/pro/planning/southcoast/executive-order-525/.
[83] South Coast Rail Inter-Agency Working Group. State Investment in the South Coast Region and Implementation of the Corridor Plan: A Retrospective Analysis. February 23, 2012.

will be used to measure consistency with the *Corridor Plan.* The first annual analysis will be released in Fall 2012.

5.5.3.2 Proposed Monitoring Program

The following sections describe the proposed monitoring and data collection responsibilities of the RPAs and the state agencies as well as the data collection administration by MassDOT. The first year of data collection would commence during the first year of construction of South Coast Rail as a baseline. Annual data collection would occur annually for state agencies and every three years for regional planning for the next 20 years provided that data are available. The state agencies would collect data annually as most of the data they collect is already collected annually as directed by EO 525 through the A&F spreadsheet. The initial data collection would be a significant effort on the part of the RPAs and state agencies**.** Therefore, MassDOT would identify funding to offset the cost.

MassDOT will request data from the RPAs annually and from A&F annually, after the data tracking has been completed and finalized each year. The RPAs' role will be to collect the necessary data from the South Coast Rail communities and other data sources such as the U.S. Census to provide to MassDOT. The RPAs are better suited to collecting data from municipalities and U.S. Census sources because of their expertise in planning research methods and their working relationships with the respective municipalities. Where applicable, data collected from the RPAs for each metric would then be aggregated by MassDOT. Municipal data collected by each of the RPAs would need to be aggregated to provide one metric for all South Coast Rail communities where applicable; however, the performance metrics would also include the metric by individual municipality and/or station area where applicable.

5.5.3.3 Regional Planning Agencies

The three RPAs (SRPEDD, MAPC, and OCPC) would be responsible for collecting the metrics which describe the South Coast region communities.

As described above, data collection would be a relatively intensive effort during the three years following the start of construction. Following the first three years, data would be collected every three years. Most of the raw data would require further manipulation since these data are input at the community-wide scale and do not distinguish projects within PPAs, PDAs, or station areas. Funding would be available to offset the cost. The RPAs would be responsible for data collection for the 20 performance metrics including:

- Metric 1: Actual and predicted growth in the number of households by community
- Metric 5: VMT for entire South Coast Region (MAPC)
- Metric 7: TDR projects by municipality
- Metric 8: Housing units per acre within PDA versus housing units per acre outside PDAs
- Metric 9: New commercial/industrial square footage meeting or exceeding 10,000 square feet in the PDAS and Commercial /Industrial square footage meeting or exceeding 10,000 square feet outside PDAs in the South Coast Region
- Metric 10: Type of new housing units located in PDAs: multifamily vs. single-family

- Metric 11: Number of municipalities with zoning revisions and type of zoning supporting PDAs
- Metric 12: Permitting changes, such as expedited permitting under Chapter 43D, within PDAs
- Metric 15: Number of municipalities that have adopted specific station area plans or have specific station area plans under development (total and by municipality)
- Metric 16: Number of municipalities adopting parking management strategies within 0.5 mile of station
- Metric 17: Amount of new bike lanes provided by municipalities
- Metric 18: Household density within 0.5 mile of station
- Metric 19: Mode share of commute to work within 0.5 mile of station
- Metric 20: Number of buildings that are LEED-Certified, developments using green building strategies and LEED for Neighborhood development Certified neighborhoods within Station Areas
- Metric 21: VMT per capita within 1 mile of station
- Metric 22: Total jobs within 0.5 mile of station
- Metric 23: Number of municipalities creating open space plans and/or revising zoning ordinances to support PPAs (conservation subdivision bylaws such as cluster development or open space residential design bylaws) and how
- Metric 24: Number of land preservation projects by community
- Metric 30: Percent of households spending greater than 30 percent of income on housing within 1 mile of Station
- Metric 31: Percent of income spent on housing and transportation within 0.5 mile of Station compared to region

5.5.3.4 State Agencies

Four state agencies are responsible to collect data in support of the metrics listed below. Those agencies include A&F, Executive Office of EEA, EOHED, and DHCD. These data would be collected annually because the majority of the data is already being collected annually through the A&F Spreadsheet. The data collection responsibilities are listed according to the state agency responsible.

Administration and Finance:

- Metric 6: State technical assistance to communities to implement Corridor Plan in dollars and type by community
- Metric 13: Direct state investments and funding in PDAs

- Metric 14: New state buildings and office leases within PDAs

Executive Office of Energy and Environmental Affairs:

- Metric 25: Percent and acreage of PPAs permanently protected
- Metric 26: Percent and acreage of PPAs developed
- Metric 27: Land preservation investment in PPAs including conservation restrictions and PARC (Self-Help), Gateway City Parks, LAND (Self-Help), land preservation programs by Department of Fish and Game and Department of Agricultural Resources; and Drinking Water State revolving fund

Executive Office of Housing and Economic Development:

- Metric 28: Number of housing production plans or housing master plans by municipality

Department of Housing and Community Development:

- Metric 29: Investment commitments targeted to Chapter 40B developments within PDAs

Department of Transportation

- Metric 2: Actual and predicted loss of farm land by community
- Metric 3: Actual and predicted loss of wetlands by community
- Metric 4: Actual and predicted loss of forestland by community

5.5.3.5 Reporting

As part of the monitoring and reporting program, MassDOT would be responsible for the reporting of results of performance metrics evaluation. MassDOT would draft a report, which would be published on MassDOT's website. The first report would be published approximately four years after the commencement of South Coast Rail Service. Subsequent reports would be available every three years after this first report, for a maximum of 20 years. The first report would include data collected for the baseline year (the first year of construction of South Coast Rail) and data collected three years of data after the baseline data collection year. Each subsequent report would include the historical data, as well as show data from the additional reporting period. The reporting schedule would be as shown in Figure 5-8.

Figure 5-8 Proposed Smart Growth Evaluation Plan Reporting Schedule

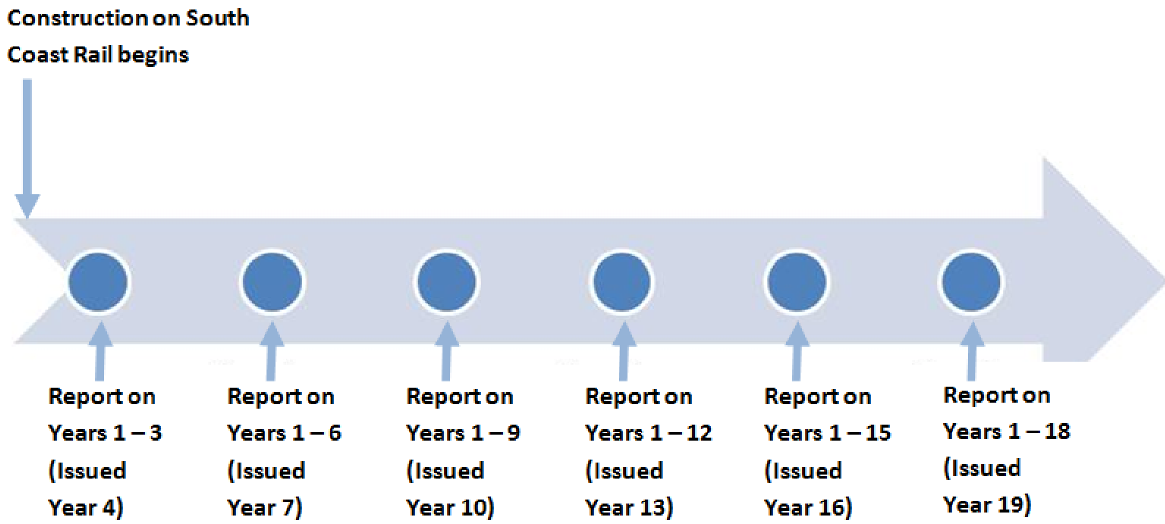


Table 5.5-2 demonstrates how each data point could be displayed (whether in a graph, chart, or table).

Table 5.5-2 Recommended Method of Reporting the Smart Growth Metrics to the Public on MassDOT's Website

Metric	Type	Representation	Additional Data Notes
1. Actual and predicted growth in the number of households by community	General	Table	Number of households per community for the reporting year compared to predicted. Total households would be reported in last row of table.
2. Actual and predicted loss of farm land by community	General	Table	Loss of acres of farmland by community for the reporting year compared to predicted. Total lost acreage would be on last row of table.
3. Actual and predicted loss of wetlands by community	General	Table	Loss of wetlands by community for the reporting year compared to predicted. Total wetland acreage lost would be on last row of table.
4. Actual and predicated loss of forest land by community	General	Table	Loss of forest land by community for the reporting year compared to predicted. Total forest land lost would be on last row of table.
5. VMT for entire South Coast region	General	Table	VMT for entire region for reporting year compared to what is predicted.
6. State technical assistance to communities to implement Corridor Plan in dollars and type by community	General	Table	Give dollar amount per community with a short description of project
7. Transfer of Development Rights project by community	General	Table	Description of each TDR project, including sending and receiving locations
8. Housing units per acre within PDA versus housing units per acre outside PDAs	PDA	Table	Table shows one row of data for housing units per acre within PDAs and one row showing housing units per acre outside PDA (the data is

Metric	Type	Representation	Additional Data Notes
			averaged for all municipalities)
9. New commercial/industrial square footage meeting or exceeding 10,000 sq. ft. in the PDAS and Commercial/ Industrial square footage meeting or exceeding 10,000 sq. ft. outside PDAs in the South Coast Region	PDA	Table	Table shows one row for data within PDA and one row for data outside PDA (the data is aggregated for all municipalities) for reporting year
10. Type of new housing units located in PDAs: multifamily vs. single-family	PDA	Table	Table shows one row for percent of multifamily and one row for single-family
11. Number of municipalities with zoning revisions and type of zoning supporting PDAs	PDA	Table	Number of municipalities with zoning revision in addition to a table which describes the type of zoning revisions by community. The table will also provide a column for the year that the zoning was adopted
12. Permitting changes, such as expedited permitting under Chapter 43D, within PDAs	PDA	Bar chart	Graph with one bar showing number of permitting changes (Chapter 43D) for PDA development and one bar showing percent of total expedited permitting changes for South Coast region
13. Direct state investments and funding in PDAs	PDA	Bar chart	Chart shows dollars in funding (y axis) by type of project (x axis) (MassWorks Infrastructure Program funding, Economic Development Fund, and Economic Development Incentive Fund, TIP projects, and Drinking Water State revolving fund)
14. New state buildings and office leases within PDAs	PDA	Table	Table has one line showing number of state buildings and number of office leases.
15. Number of municipalities that have adopted specific station area plans or have specific station area plans under development (total and by station area)	TOD	Table	Number and table showing specific area plans and status by station area
16. Number of municipalities adopting parking-management strategies within 0.5 mile of station	TOD	Graph	Number of municipalities.
17. Amount of new bike lanes provided by municipalities	TOD	Table	Table showing one column for number of new bike paths and one column for miles of new bike lanes (aggregate for all communities)
18. Household density within 0.5 mile of station	TOD	Table	Household density in number (average for all stations)
19. Mode share of commute to work within 0.5 mile of station	TOD	Table	Commute to work by mode (average for all stations) and by station

Metric	Type	Representation	Additional Data Notes
20. Number of buildings that are LEED-Certified, developments using green building strategies and LEED for Neighborhood development Certified neighborhoods within Station Areas (within 1 mile of station)	TOD	Table	Number of LEED buildings and green buildings within 1 mile of station by community
21. Vehicle miles traveled (VMT) per capita within 1 mile of station	TOD	Table	VMT within 1 mile of station (aggregate for all stations) and by station
22. Number of jobs within 1 mile of station	TOD	Table	Jobs within 1 mile of station (aggregate for all stations) and by station
23. Percent and acreage of PPAs that have been permanently protected	PPA	Table	Bar chart
24. Percent and acreage of PPAs developed	PPA	Table	Bar chart
25. Municipalities creating open space plans and/or revising zoning ordinances to support PPAs (conservation subdivision bylaws such as cluster development or open space residential design bylaws) and how	PPA	Table	List of zoning revisions supporting PPAs (by community and status and description of each zoning revision)
26. Land preservation investment including conservation restrictions and PARC (Self-Help), Gateway City Parks, LAND (Self-Help), land preservation programs by Department of Fish and Game and Department of Agricultural Resources; and Drinking Water State revolving fund	PPA	Bar chart	Financial investment in land preservation bar chart by year (x axis) and investment in dollars (y axis)
27. Number of land preservation projects by community and type	PPA	Table	Number of municipalities with land preservation projects in addition to a table which describes the land preservation project by community.
28. a) Number of housing production plans b) Number of housing master plans	Social Equity	Table	Table showing column of number of housing production plans and column of master plans (listing by community)
29. Investment commitments targeted to Chapter 40B developments within PDAs	Social Equity	Bar chart	Chart shows dollars in funding (y axis) by year (x axis) for 40B developments
30. Percent of households spending greater than 30 percent of income on housing	Social Equity	Table	Table shows percent of income spent on housing within 1 mile of station (average for all stations as well as by station)

Metric	Type	Representation	Additional Data Notes
within 1 mile of station			
31. Percent of household income spent on housing and transportation within 0.5 mile of station compared to region	Social Equity	Table	Table shows percent of income spent on housing and housing within 0.5 mile of station (average for all stations as well as by station and region)

Tables 5.5-3 and 5.5-4 and Figure 5-9 depict how data could be presented visually. Please note that these graphics are for illustrative purposes only and do not represent actual data.

Table 5.5-3 Sample Metric 4. Forest Land Impacts (in acres)

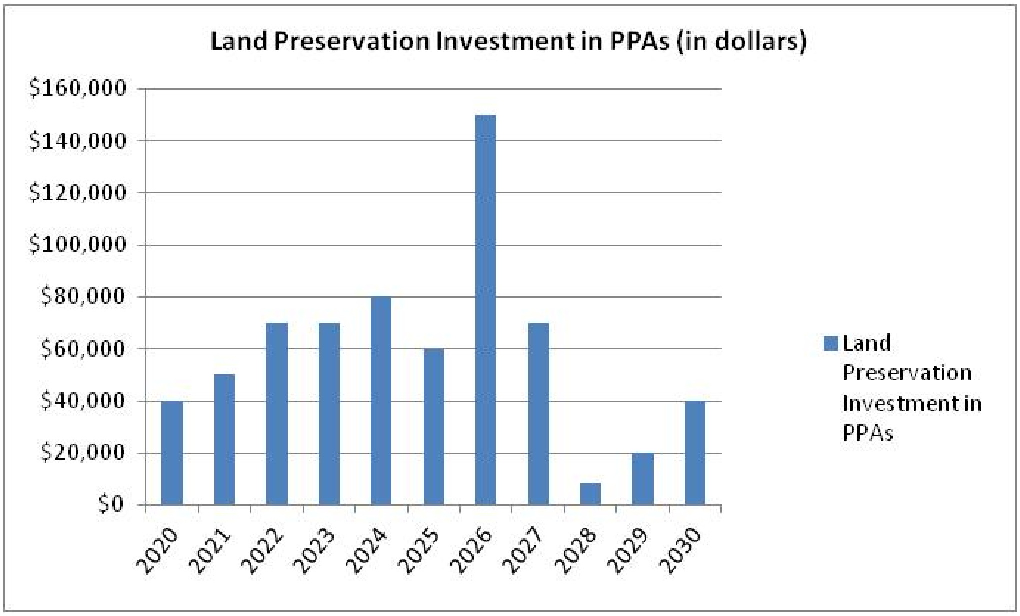
	Forest Land Impacts (in acres)	
Scenario	2020	2030
No-Build		23,736
Build without Smart Growth		24,311
Smart Growth Scenario		16,600
Actual Forest Land Impacts	10,000[1]	18,000[2]

Note: Actual Forest Land Impacts are cumulative total impacts since existing conditions data provided by MassGIS in 2005.
1 MassGIS, forest land data updated 2018.
2 MassGIS, forest land data updated 2029.

Table 5.5-4 Sample Metric 11 and Metric 15. SCR Zoning Revisions and Plans to Support PDAs and Station Areas.

Community	Zoning Ordinance Supporting PDAs and Station Areas	Year	Status
Acushnet	Town creating a 40R district, to encourage mixed-income housing within PDA.	2025	In progress.
Fall River	City developed TOD zoning adjacent to the Station Area.	2024	Adopted May 10, 2024.
Freetown	SRPEDD worked with the city to develop TOD zoning beginning in fall 2009.	2024	Adopted April 20, 2024.
New Bedford	Developed specific area plans for station-area TOD for the Whale's Tooth and King's Highway station sites.	2023	Adopted April 10, 2023.
Taunton	Began developing a 40R district within a PDA.	2023	On hold.

Figure 5-9 Sample Metric 26. Land Preservation Investment in PPAs



Note: Land Preservation includes conservation restrictions and PARC (Self-Help), Gateway City Parks, LAND (Self-Help), land preservation programs by Department of Fish and Game and Department of Agricultural Resources; and Drinking Water State revolving fund.

5.5.4 Agency Coordination

The Secretary's Certificate specifically requested that MassDOT form a Working Group devoted to the implementation of the Corridor Plan. To meet this requirement, MassDOT convened the ICG Smart Growth Working Group, a subset of the ICG and included representatives from EPA, EOHED, Executive Office of EEA, MassDEP, and the RPAs. The purpose of the ICG Smart Growth Working Group was to develop evaluation indicators and metrics. In addition to the meetings described below, MassDOT worked closely with EOHED and SRPEDD staff to develop the range of metrics. MassDOT convened a meeting on April 16, 2012 with the Working Group, to present proposed performance metrics. Following the April meeting, MassDOT refined the performance metrics based on the feedback at that meeting and subsequent coordination with the RPAs and EOHED. The Smart Growth Work Group met again on June 27, 2012. At this meeting, MassDOT proposed a monitoring and evaluation plan to assess the accuracy of impact projections and allow for mid-course corrections and adaptive strategies as needed and performance metrics to evaluate the effectiveness of smart growth plans and environmental protection strategies.

6 COMMITMENT OF RESOURCES

6.1 INTRODUCTION

This chapter presents a discussion of the permanent commitment of resources of the South Coast Rail alternatives and an evaluation of the potential "costs" of consumption of environmental resources during the short-term construction phase of the South Coast Rail alternatives compared to the longer term productivity benefits associated with the operation of the South Coast Rail alternatives. In accordance with NEPA and the CEQ's implementing procedures under Title 40, Part 1502 of the Code of Federal Regulations, any EIS prepared pursuant to NEPA must include an analysis of both the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and of any irreversible or irretrievable commitments of resources that would occur should the action be implemented (see 40 CFR 1502.16).

6.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

6.2.1 Introduction

Resources that would be irreversibly and irretrievably committed to the South Coast Rail alternatives include funds, land, construction materials, energy and labor. However, based on social and economic studies undertaken for the analysis of potential impacts as a result of the South Coast Rail alternatives, these are not considered to be in limited supply. Thus, the use of such resources in the construction of the South Coast Rail alternatives would not adversely impact the availability of such resources for other projects both now and in the future.

Depending on the Build Alternative, it is estimated that expenditures for labor and materials during the construction phase would generate approximately 7,000 to 8,000 jobs for the Stoughton and Whittenton rail alternatives[1] (see Chapter 4.3, *Socioeconomics*). The use of labor for the construction of the proposed Build Alternatives would thus be a temporary benefit consistent with local, regional and state plans for the maintenance and expansion of employment opportunities in the South Coast region.

The Build Alternatives could also irreversibly and irretrievably alter visual resources, historic resources, open space, ACECs, farmland, plant, wildlife and fish communities and habitats and wetlands. The No-Build (Enhanced Bus) Alternative would also irreversibly and irretrievably commit funds, land, construction materials, energy and labor to maintain transportation facilities including rail facilities and the roadway network and to make limited improvements to existing Park and Ride facilities.

6.2.2 No-Build (Enhanced Bus) Alternative Irreversible and Irretrievable Commitment of Resources

The No-Build (Enhanced Bus) Alternative would result in an irreversible or irretrievable commitment of resources associated with maintenance and potential rehabilitation activities that could be taken over the short-term and long-term to address safety and level of service deficiencies of the existing transportation facilities. Maintenance of existing transportation facilities (rail and roadway) and rehabilitation of park-and-ride facilities and other improvements under the No-Build (Enhanced Bus)

[1] EOT. 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. Pg. 9.

Alternative would require commitments of construction materials, energy, labor and funds. Land use along the highway alignments is generally designated as transportation/utilities. These alignments would not change and no substantial new construction or land acquisition would be required for the No-Build (Enhanced Bus) Alternative.

Over the short-term, commitments of funds, materials, energy, land and labor under the No-Build Alternative would be less than those under the Build Alternatives because construction of the proposed project would not occur. However, over the long-term, energy use under the Build Alternatives will generally be lower than the No-Build Alternative because of improvements in transportation efficiency.

The cost of long-term transportation facilities maintenance under the No-Build Alternative compared to the Build Alternatives is uncertain. The Build Alternatives may make improvements to railroad infrastructure that would need to be maintained in the future. The No-Build Alternative may require more maintenance to compensate for the increased use of existing transportation facilities (rail or roadways) without the Build Alternatives.

6.2.3 Build Alternatives Irreversible and Irretrievable Commitment of Resources

6.2.3.1 Commitments of Funds

Federal funding has been provided for environmental review and Preliminary Engineering for the expansion of South Station and the selection of layover facilities in Boston and for the reconstruction of freight rail bridges in the New Bedford area. While the South Coast Rail project would utilize these facilities, these federally funded facilities have independent utility, as described in Chapter 3. To the extent that financial resources for construction would be provided through federal funds, local funds and/or private investments, such resources would not be available for other uses.

The commitment of financial resources would produce a one-time benefit to the local and regional economy through labor and capital expenditures for construction and, secondarily, through the flow of these monies within the local economy. These benefits would take the form of a temporary increase in demand for goods and services provided locally, earnings of local employees and jobs. (See Chapter 4.3, *Socioeconomics*). The long-term benefits of the project alternatives are described in the *South Coast Rail Economic Development and Land Use Corridor Plan.* The rail alternatives are anticipated to generate $448 million to $487 million in annual new business output by 2030.

Tax revenue losses are considered to be an irretrievable commitment associated with the Build Alternatives. Direct losses to the local governments as a result of the Build Alternatives include property tax payments that would be lost due to the acquisition of taxable properties within the proposed right-of-way. For most communities, with the exception of Fall River and New Bedford, the anticipated municipal property tax revenue loss would be on the order of 0.01 percent of their total municipal tax revenues. The Corridor Plan anticipates that property tax revenues will increase in cities and towns in the South Coast region, particularly in the areas around stations, due to the value added by new transportation access.

6.2.3.2 Commitments of Land

As described in Chapter 4.2, *Land Use and Zoning*, and Chapter 3, *Alternatives*, up to 136 acres of land (public and private) would be committed for the construction and operation of the proposed project. The land used in the construction of any of the Build Alternatives is considered to be an irreversible commitment during the time period that the land is used for construction and during the operational

periods. Should, however, a greater need arise for the use of the land, or should the proposed project no longer be needed, the land could be converted and committed to another use. However, there is no indication that such a need for conversion could develop or would be desirable.

6.2.3.3 Commitments of Energy and Materials

The Build Alternatives would require the use of various types of fossil fuels, electrical energy and other resources during construction and operation. These resources are considered to be irretrievably committed to the project. At this time, these resources are not in short supply and considered to be readily available to the Build Alternatives. As a result, the use of these resources is not expected to result in an adverse effect upon the continued availability of these resources.

The Build Alternatives would require the commitment of various types of construction materials, including steel, aggregate, cement, asphalt (bituminous materials), electrical supplies, piping and other raw materials such as metal, stone, sand and fill material. Additionally, large amounts of labor and natural resources would be committed to the fabrication and preparation of these construction materials. This commitment of resources is irretrievable but the resources are not in short supply and their use would not result in any adverse effect upon their continued availability. Much of the material accumulated for construction may at some time be recycled or used for fill or for some other use. In addition, to the greatest extent practicable, the Build Alternatives would use recycled building materials, thereby reducing the demand for new construction materials.

Development of the proposed alternatives and implementation of mitigation would result in a temporary increase in energy and fuel consumption during construction. The initial operation of the Build Alternatives may result in a slight increase in energy consumption when compared to the No-Build (Enhanced Bus) Alternative. However the Build Alternatives would be expected to result in a long-term decrease in energy consumption, through increased travel efficiency along new or improved transit routes (rail or bus) during operation.

6.2.3.4 Commitments of Labor

Depending on the Build Alternative, it is estimated that the construction phase would require the commitment of labor resources in the amount of approximately 7,000 to 8,000 jobs for the rail alternatives[2] (see Chapter 4.3, *Socioeconomics*). These workers will, by necessity, not be available for other projects during the construction period and should be considered as irretrievably committed to the proposed project.

6.3 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

6.3.1 Introduction

NEPA requires the disclosure of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, in other words, the tradeoffs between the potential adverse impacts of the proposed project and the potential long-term benefits of the proposed

[2] EOT. 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy: Boston. Pg. 9.

project. This section defines “short-term” as being construction related and “long-term” as being the operational phase of the proposed project.

6.3.2 Short-term Uses

The No-Build Alternative would not require substantial construction and this would not result in any short term impacts. Short-term construction impacts of the build alternatives would be associated with the economics of affected and displaced businesses; traffic detours; pedestrian and bicycle access; noise and vibration; and air quality, including dust. The construction of the Build Alternatives would create economic benefits during construction, in the form of jobs and the direct and indirect demand for goods and services associated with construction activities (see Chapter 4.3, *Socioeconomics*).

The public transportation system between the South Coast region and Boston does not meet current and future regional transportation needs, as described in Chapter 2, *Purpose and Need*, Chapter 3, *Alternatives*, and Chapter 4.1, *Transportation*. If the Build Alternatives were not constructed, the transportation service provided by the existing transportation network between the South Coast region and Boston would continue to decline and demand for transportation would increasingly go unmet, both qualitatively and quantitatively.

The Build Alternatives would have greater impacts during the construction period than the No-Build Alternative. The environmental effects of the Build Alternatives are described in detail in Chapter 4, *Affected Environment and Environmental Consequences*, and Chapter 5, *Indirect Effects and Cumulative Impacts*. Depending on the alternative, adverse direct construction impacts may include residential and commercial displacements, disruption of existing traffic patterns, temporary noise and dust, and the disturbance of soils, vegetation, wildlife habitat, wetlands and open space. Most of the adverse impacts can be minimized through mitigation, as described in detail for each resource topic in Chapter 4 and summarized in Chapter 7, *Proposed Mitigation and MASSDOT Proposed Section 61 Findings*. Beneficial short-term construction impacts include economic benefits to the South Coast region through the generation of new employment and local expenditures.

6.3.3 Long-term Productivity

The operation of the Build Alternatives may have long-term adverse impacts including the encroachment/fragmentation of wildlife habitat, wetland filling, impacts on vegetation and open space, impacts on historic resources, impacts on visual resources, increased use of de-icing salts, minor increases in pollutant loadings to surface water bodies, and incompatibilities with local land uses and community character as a result of noise. Most of the adverse impacts can be mitigated or avoided, depending on the alternative. The alternatives themselves present trade-offs between the long-term productivity impacts on different resource categories.

The long-term benefits of the Build Alternatives include improved transportation access (both qualitative and quantitative) and enhanced access to important employment centers, educational and community facilities. The Build Alternatives would also contribute to improved safety conditions and air quality and reduction of Greenhouse Gas emissions, as described in Chapter 2, *Purpose and Need*, Chapter 3, *Alternatives*, Chapter 4.1, *Transportation*, Chapter 4.4, *Environmental Justice*, and Chapter 4.9, *Air Quality*.

In comparison to the short-term and long-term environmental consequences and mitigation, the operation of the Build Alternatives would contribute to the overall enhancement of the quality of life in

and throughout the South Coast region. The Build Alternatives would improve travel conditions and efficiency, thus contributing to long-term productivity.

Through the construction and operation of the Build Alternatives, the following improvements would occur:

- Improvement in availability of public transportation between the South Coast region and Boston.
- Improvement in the quality of transit service between the South Coast region and Boston, in terms of travel time and reliability.
- Reduction in VMT and reduced congestion. All Build Alternatives would result in a reduction of the number of miles driven by automobiles, as the Build Alternatives would induce commuters to travel by train or bus rather than drive between Boston and the South Coast region. Fewer cars on the road would ease congestion along highway corridors, resulting in time benefits.
- Improvement of air quality. The reduction in driving as a result of the Build Alternatives would reduce emissions of pollutants by mobile sources, thereby contributing to cleaner air.
- Reduction of Greenhouse Gas emissions. The reduction in driving as a result of the Build Alternatives would contribute to reduced emissions of CO_2 and other greenhouse gases.
- Improved safety conditions for motorists, bicyclists, pedestrians and school children along the main highway corridors and in the roadway network, as a result of reduced traffic congestion due to the Build Alternatives.
- Reduction in automobile related noise, due to reduction in automobile VMT.
- Enhanced regional mobility. In addition to improving access between the South Coast region and Boston, the Build Alternatives would also enhance mobility within the region by including interregional links that provide one-seat rides from one municipality to another.
- Improvement in access and travel time to jobs colleges, hospitals, and Boston for environmental justice populations in Fall River, New Bedford and Taunton, as described in Section 3.3.3.1 of Chapter 3, *Alternatives*.
- Smart Growth benefits. According to the South Coast Rail Economic Development and Land Use Corridor Plan,[3] commuter rail service to the South Coast would generate nearly $500 million in new economic activity every year. This is new growth by the year 2030 that would not occur without the new infrastructure. The rail connection is projected to create between 3,500 and 3,800 net new jobs within the Commonwealth by 2030—about two-thirds of which would locate in the South Coast region with the remaining third in Boston-Cambridge and other communities outside the region.

[3] EOT. 2009. South Coast Rail Economic Development and Land Use Corridor Plan. Commonwealth of Massachusetts, Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. Prepared by Goody Clancy. Boston.

The construction of the Build Alternatives would be phased and only portions of the project area would be committed as a construction site at any given time (see Section 3.2 of Chapter 3, *Alternatives*). Therefore, the land area to be used during the various construction phases is considered as a short-term use while during the operation of the proposed project this land area is considered to be a long-term use. The productivity of this land, in terms of its economic productivity in generating property and sales taxes, would be lost during this period and in the long-term, but may be recovered through the economic development predicted by the Corridor Plan.

The construction period will generate new productivity in terms of new construction related employment, new payrolls and purchases of materials, supplies and services. As a result of the proposed project, non-construction related employment would be generated temporarily during the period of construction, with the addition of new purchases both from construction related activity and the added expendable income resulting from the generated part-time and permanent employment.

Depending on the alternative, the long-term effect of the construction and operation of the proposed project would be to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, Massachusetts to enhance regional mobility (see Chapter 2, *Purpose and Need*).

7 PROPOSED MITIGATION AND MASSDOT PROPOSED SECTION 61 FINDINGS

7.1 INTRODUCTION

The CEQ regulations for implementing the NEPA require an EIS to discuss means to mitigate adverse environmental impacts (40 CFR 1502.16(h) and 1502.14(f)).

In accordance with the NEPA regulations, this chapter identifies and evaluates measures that would avoid or minimize impacts. As summarized in this chapter and discussed in greater detail in Chapter 4, certain impacts to environmental resources are unavoidable. For those impacts measures that minimize adverse impacts have been identified. These measures are discussed at the end of each resource section in Chapter 4 and summarized in this chapter.

The MEPA regulations, at 301 CMR 11.07(j), outline mitigation measures to be addressed in the EIR process, including an "assessment of physical, biological and chemical measures and management techniques designed to limit negative environmental impacts or to cause positive environmental impacts during development and operation of a Project."

The Secretary's Certificate[1] on the DEIR for the South Coast Rail project included requirements for the scope of the FEIR. The Certificate required that the FEIR include:

- "Details on the proposed measures, roles and responsibilities, and MassDOT's commitments to implement specific measures to promote smart growth and achieve the mitigation and environmental benefits described in the DEIR/S. The FEIR should discuss the mitigation planning and outreach process conducted during FEIR preparation."

- "Revised Section 61 Findings for all state agency permits that reflect the detailed mitigation commitments to be provided in the FEIR. [Greenhouse gas] commitments and related self-certification language should be included in the draft Section 61 Findings for [Massachusetts Department of Environmental Protection] permitting."

- "A separate chapter on mitigation measures, which should include a summary table of all mitigation commitments as well as the revised Section 61 Findings. The Section 61 Findings should describe the proposed mitigation measures, contain clear commitments to mitigation and a schedule for implementation, and identify parties responsible for funding and implementing the mitigation measures. The draft Section 61 Findings will serve as the primary template for permit conditions. Final Section 61 Findings will be included with all state permits issued for this project and will include conditions considered binding upon the proponent as mitigation commitments."

This chapter (Section 7.4) provides a description of MassDOT's commitments to mitigation for impacts on each of the environmental and social resources identified in the Secretary's Certificate on the ENF, with summary table listings all of the mitigation commitments (Tables 7.5-1 and 7.5-2). MassDOT's proposed Section 61 Findings are included as Section 7.2.

[1] Executive Office of Energy and Environmental Affairs. *Certificate of the Secretary of Energy and Environmental Affairs on the Draft Environmental Impact Report/Statement, South Coast Rail Project*. June 29, 2011.

7.2 PROPOSED SECTION 61 FINDINGS

This section of this joint FEIS/FEIR was contributed by MassDOT, which is solely responsible for its content. The information contained in this section is pertinent to the FEIR only, pursuant to the proponents' responsibilities under the Massachusetts Environmental Policy Act. The U.S. Army Corps of Engineers is not a proponent, does not have a role in MEPA compliance and does not have a position with regard to the data contained herein.

Massachusetts General Law Chapter 30, Section 61 authorizes state agencies with permitting responsibilities to make an official determination regarding potential impacts from a proposed project and whether impacts have been avoided, minimized, and/or mitigated for appropriately. The Law requires agencies/authorities to issue a determination that includes a finding describing the environmental impact, if any, of the project and whether all feasible measures have been taken to avoid or minimize said impact.

This section provides a brief overview of the project, explains the history of the MEPA review process for the proposed South Coast Rail project, outlines required state and federal permits and their authorities, summarizes mitigation commitments for permanent and construction-related impacts, and provides draft Section 61 determination language for state agencies.

7.2.1 Project Description

The South Coast Rail project is an initiative of MassDOT and the MBTA to bring public transportation to the South Coast region that will increase access to transit for an underserved area of the state, increase transit ridership, improve regional air quality, reduce greenhouse gas emissions, and support opportunities for smart growth and economic development.

The restoration of passenger rail service to the South Coast region has been extensively studied for over 20 years. Prior to 1958, the Middleborough, Stoughton, and Attleboro rail lines were part of the Old Colony Railroad system that provided service to Fall River and New Bedford from Boston's South Station, via Canton Junction, along the Stoughton Branch railroad. Since discontinuation of this service, commuter rail has only been available to southeastern Massachusetts along the Boston-Providence Shore Line, with stops in Attleboro and South Attleboro, and the Old Colony Middleborough Line, which terminates in Lakeville. However, none of these provide an opportunity for commuters from the Fall River or New Bedford areas to easily or efficiently access rail transportation to Boston.

The MBTA has analyzed six alternatives for providing improved transportation between downtown Boston and the cities of Fall River and New Bedford. The three alternatives considered most viable were: (1) extending the existing MBTA Stoughton Line, (2) extending the existing MBTA Middleborough Line, and (3) providing new service, branching off from the Providence Line near Attleboro. A non-rail alternative, Rapid Bus, was also analyzed.

The Stoughton Alternatives would use existing active commuter and freight rail tracks (the Northeast Corridor, Stoughton Line, New Bedford Main Line, and Fall River Secondary) and a segment of out-of-service rail right-of-way (the Stoughton Line between Stoughton Station and Weir Junction in Taunton). Three existing commuter rail stations would be modified (Canton Junction, Canton Center, and Stoughton) and ten new stations constructed (North Easton, Easton Village, Raynham Place, Taunton, Taunton Depot, Freetown, Fall River Depot, Battleship Cove, King's Highway, and Whale's Tooth). The

South Coast Rail project also includes two overnight layover facilities, at the Weaver's Cove East site in Fall River and at the Wamsutta site in New Bedford.

MassDOT has identified the Stoughton Alternative as its Preferred Alternative and has not identified a preference between the Stoughton Electric and Stoughton Diesel Alternatives (see MassDOT's Preface to the FEIS/FEIR).

The South Coast Rail project also includes two overnight layover facilities, at the Weaver's Cove East site in Fall River and at the Wamsutta site in New Bedford.

The railway would consist of single track, with passing sidings as needed, to reduce wetland impacts. A trestle through the Hockomock Swamp ACEC would minimize impacts to wildlife habitat and rare species. Stations have been designed to minimize traffic impacts and land acquisitions.

7.2.2 History of MEPA Review

The restoration of passenger rail service to the South Coast region has been extensively studied for almost twenty years. Prior to 1958, the Middleborough, Stoughton (via the Whittenton Route), and Attleboro rail lines were part of the Old Colony Railroad System that provided service to Fall River and New Bedford from Boston's South Station, via Canton Junction, along the Stoughton Branch railroad. Since discontinuation of this service, commuter rail has only been available to southeastern Massachusetts along the Boston-Providence Shore Line, with stops in Attleboro and South Attleboro, and the Old Colony Middleborough Line, which terminates in Lakeville. However, none of these provide an opportunity for commuters from the Fall River or New Bedford areas to easily or efficiently access rail transportation to Boston.

In 2000, the MBTA completed a DEIR that analyzed six alternative routes for providing improved transportation between downtown Boston and the cities of Fall River and New Bedford. The DEIR focused on what were viewed then as the three most viable alternatives: (1) extending the existing MBTA Stoughton Line, (2) extending the existing MBTA Middleborough Line, and (3) providing new service, branching off from the Providence Line near Attleboro.

In 2002, a FEIR, submitted by the MBTA, concluded that extending the Stoughton Line was the most practicable and feasible of the alternatives and MassDOT received state-level approval from the Secretary of Environmental Affairs to proceed with planning for the South Coast Rail project as an extension of the existing Stoughton Line. On August 30, 2002, the MEPA Secretary issued a Final Certificate (Executive Office of EEA File # 10509) stating that the FEIR adequately and properly complied with MEPA and its implementing regulations. Due to the lapse of time, MassDOT has undertaken a new review under MEPA.

An ENF was submitted for review under MEPA on November 15, 2008. After public review, the Secretary of the Executive Office of EEA issued a Certificate on the ENF on April 2, 2009. The Certificate found that an Environmental Impact Report was required, and provided a detailed scope for that document.

As noted above, for the project to proceed to construction, it is necessary to obtain a Clean Water Act Section 404 permit from the Corps to authorize placement of dredged or fill material in "waters of the United States." Therefore, the USACE is conducting a review of the project under NEPA. A Notice of Intent to prepare an EIS was published in the Federal Register on October 31, 2008.

On March 23, 2011, the Notice of Availability for the South Coast Rail project DEIS/DEIR was published in the Environmental Monitor. The USEPA published a NEPA Notice of Availability in the Federal Register on March 25, 2011. After detailed review, on June 29, 2011 the Secretary issued a Certificate on the 2011 DEIR. The Secretary's Certificate stated that "I hereby determine that the Draft Environmental Impact Report/Statement (DEIR/S) submitted for this project adequately and properly complies with MEPA. The Proponent, the Massachusetts Department of Transportation (MassDOT) should submit a FEIR in accordance with the Scope below. As was the case with the DEIR/S, MassDOT may adopt the Final Environmental Impact Statement (FEIS), which is being prepared by the U.S. Army Corps of Engineers, as its FEIR and submit a combined Final EIR/EIS for MEPA review, as long as the FEIS meets the scope below." The Secretary's Certificate on the 2011 DEIR also stated that "I am satisfied that MassDOT has made the case for the Stoughton Route to be brought forward as the preferred alternative in the FEIR. …MassDOT did not identify a preferred mode among the diesel and electric alternatives. However, because the electric alternative is preferable from an air quality perspective, the Stoughton Electric [Alternative] should be the focus of the FEIR."

For the purpose of NEPA and Section 404(b) permitting, both the Stoughton and Whittenton Alternatives (electric and diesel versions) were evaluated in this FEIS/FEIR.

7.2.3 Related Permits and Approvals

In addition to compliance with the NEPA and the MEPA, a number of local, state, and federal permits are needed for the proposed project, as listed in Table 7.2-1.

Table 7.2-1 Required Permits and Approvals

Issuing Agency	Approval or Permit
U.S. Army Corps of Engineers	Clean Water Act, Section 404 Individual Permit
	Section 10 of the Rivers and Harbors Appropriation Act of 1899
U.S. Environmental Protection Agency Region I	National Pollutant Discharge Elimination System, Construction General Permit
U.S. Coast Guard	Section 9 of the Rivers and Harbors Appropriation Act of 1899
Massachusetts Office of Coastal Zone Management	Coastal Zone Management, Federal Consistency Determination
Massachusetts Executive Office of Energy and Environmental Affairs	Public Benefits Determination
Massachusetts Department of Environmental Protection	Massachusetts Wetlands Protection Act Variance
	Massachusetts Public Waterfront Act License(s) (Chapter 91)
	Clean Water Act, Section 401 Water Quality Certificate
	Section 61 Finding
Massachusetts Department of Fish and Game	Massachusetts Endangered Species Act Conservation and Management Permit
Massachusetts Historical Commission	Review of project for impacts to historic and archaeological properties and approval for compliance with M.G.L. Chapter 9, Sections 26-27C
	Memorandum of Agreement (with Corps and MassDOT)
	Section 61 Finding

7.2.4 Draft Section 61 Findings

Draft Section 61 Findings for the Project have been prepared by MassDOT to comply with the requirements of Massachusetts General Laws, Chapter 30, Section 61, and MEPA regulations at 301 CMR 11.07(6)(k), which require state agencies and authorities to review, evaluate, and determine the impacts on the natural environment of all projects or activities requiring permits issued by the state. State agencies are also asked to issue findings describing environmental impacts and to certify that all feasible measures have been taken by MassDOT to avoid or minimize these impacts. Section 61 Findings will be required from agencies with responsibilities for issuing the following permits, and from MassDOT for funding for the construction:

- Section 401 Water Quality Certification;
- Wetland Protection Act permit Variance;
- Massachusetts Endangered Species Act Conservation and Management Permit; and
- Massachusetts Public Waterfront Act (Chapter 91) License.
- Massachusetts Coastal Zone Management Consistency Determination

The italicized text in the following paragraphs is a proposed Section 61 Finding by MassDOT that extends to cover all potential impacts of the project.

Project Name:	*South Coast Rail*
Project Location:	*Fall River/New Bedford to Boston*
Project Proponent:	*Massachusetts Department of Transportation*
EOEA Number:	*14346*

The potential environmental impacts of the project have been characterized and quantified in the Final EIS/EIR, which are incorporated by reference into this Section 61 Finding. Throughout the planning and environmental review process, MassDOT has been working to develop measures to mitigate significant impacts of the proposed safety improvements. With the mitigation proposed and carried out in cooperation with state agencies, [Agency] finds that there are no significant unmitigated impacts.

MassDOT has prepared Tables of Mitigation (Tables 7.4-1, 7.5-1 and 7.5-2 of the FEIS/FEIR) that specify, for both temporary and permanent impacts, the mitigation that MassDOT will provide.

Therefore, [Agency] having reviewed the MEPA filings for the South Coast Rail Project, including the mitigation measures summarized in Chapter 7 of the FEIS/FEIR, finds pursuant to M.G.L. C. 30, §61 that, with the implementation of these mitigation measures, all practicable and feasible means and measures will have been taken to avoid or minimize potential damage from the project to the environment. In making this finding, [Agency] has considered reasonably foreseeable climate change impacts, including additional greenhouse gas emissions, and effects, such as predicted sea level rise.

7.3 AVOIDANCE AND MINIMIZATION

As described throughout this FEIS/FEIR, measures have been identified to avoid and minimize impacts, while meeting the transportation purpose and need of the project.

Chapter 3 describes the alternatives analysis process that resulted in selection of the Stoughton Alternative as the Preferred Alternative. This alternative best meets the project purpose and need balanced with a minimum of environmental impacts.

The Stoughton Alternative has been designed by MassDOT to avoid or minimize impacts to environmental and social resources. This alternative was developed to maximize the use of existing transportation infrastructure corridors, thereby avoiding or minimizing impacts to undeveloped lands and natural resources. Chapter 3 documents the iterative process of identifying sites for potential stations and layover facilities that sought to avoid impacts to wetlands, threatened and endangered species habitat, water resources, ACECs and open space, as well as to residential areas and businesses. The railway would consist of single track, with passing sidings as needed, to reduce wetland impacts. A trestle through the Hockomock Swamp ACEC would minimize impacts to wildlife habitat and rare species. Stations have been designed to minimize traffic impacts and land acquisitions.

MassDOT anticipates that additional measures to minimize unavoidable impacts would be undertaken during the preliminary and final design through (among other elements) the refined grading design of tracks and roadways, station layout, and the design of bridges and culverts to meet Massachusetts River and Stream Crossing Standards where feasible. Unavoidable impacts will be mitigated as described below.

7.4 PROJECT MITIGATION COMMITMENTS

The South Coast Rail Stoughton Alternative was developed to meet the critical transportation need of the Project, while recognizing the need to balance the Project's benefits with the direct and indirect impacts on natural resources, including the use of mitigation strategies. This has been an ongoing iterative process that will continue to identify and incorporate additional avoidance and minimization strategies through further, more detailed design, construction and operation. Some impacts to natural resources are unavoidable.

Pursuant to the USEPA Section 404(b)(1) Guidelines, the Corps of Engineers, in its Section 404 review, applies a 3-tiered approach in evaluating mitigation proposals. In conducting the 404(b), the Corps must ensure (1) avoidance of impacts to the aquatic environment to the maximum extent practicable; (2) minimization of impacts to the aquatic environment to the extent practicable and finally (3) compensatory mitigation of unavoidable aquatic resource losses. Further, the LEDPA determination is made independent of evaluation of mitigation.

MassDOT's mitigation commitments are consistent with the requirements for federal environmental review by the USACE. The level of detail at this stage of design is appropriate to support the environmental analysis, comparison of the No-Build and Build Alternatives, and development of conceptual mitigation measures. During preliminary and final design more detailed and specific mitigation measures and comparison of mitigation alternatives will be developed.

The following sections provide an overview and outline of the conceptual mitigation measures for impacts identified in Chapter 4 that would be developed as more specific, implementation-oriented

mitigation measures during preliminary and final design. The mitigation measures that MassDOT and MBTA have committed to are listed in Table 7.5-1 and 7.5-2 for permanent and construction impacts, respectively. The mitigation requirements described in the Secretary's Certificate on the 2011 DEIR are also listed; the mitigation requirements of the Secretary's Certificate on the 2008 ENF were provided in the 2011 DEIR and are not reiterated here.

7.4.1 Transportation

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should

- Respond to the comments regarding traffic congestion and potential delays in emergency services and include details of any mitigation proposed.

Section 4.1.5 of this FEIS/FEIR provides an overview of the transportation mitigation measures that will be incorporated during preliminary and final design, and reviewed with the individual municipalities as part of the final design process. The proposed traffic mitigation measures include improvements to pedestrian facilities (crosswalks, sidewalks), roads (streets, signage, traffic signals), grade crossings (gates, signals), and coordinating with local emergency service providers during design. The specific locations where mitigation measures are proposed for transportation impacts are listed in Table 7.4-1, while the overall mitigation commitments are provided in Tables 7.5-1 and 7.5-2.

Table 7.4-1 Proposed Traffic Mitigation Measures near Stations

Station	Intersection/Roadway	Mitigation
North Easton Station	Route 138 at Roche Bros. Way	Revise signal timings
	Route 138 at Main St.	Revise signal timing, including longer pedestrian timings
	Route 138 at Elm St.	Widen Route 138 to provide two lanes northbound and southbound Install traffic signal
	Route 138 at Union St.	Widen Route 138 to provide two lanes northbound and southbound Install traffic signal
Easton Village Station	Route 138 at Belmont Street	Revise signal phasing and timings
	Main Street at Center Street/Lincoln Street	Install pavement marking and signage improvements
	Lincoln Street at Barrows Street	Install pavement marking and signage improvements
Raynham Park Station	Route 138 at Elm St.	Revise signal timing, including longer pedestrian timings
	Arlington Street at School Street	Re-align Robinson Street to create 4-way intersection Widen Route 138 to provide two lanes northbound and southbound Install traffic signal
Taunton Station	Broadway and Washington Street	Revise signal timing
	Dean Street at Longmeadow Street	Restripe Longmeadow Street to provide two southbound lanes Revise signal timing, including longer pedestrian timings
	Dean Street at Prospect Street	Install pavement marking and signage improvements

Station	Intersection/Roadway	Mitigation
	Dean Street at Arlington Street	Reconstruct traffic signal system based on new adjacent grade crossing equipment Widen Arlington Street to provide two southbound lanes
	Arlington Street at School Street	Convert to all-way stop
Taunton Depot Station	Route 140 at Hart Street	Revise signal timing
	Taunton Depot Drive	Construct sidewalk along the northern side of the Target Plaza parking lot to station area
King's Highway Station	King's Highway	Install signal interconnect infrastructure between Mount Pleasant Street and Church Street
	Mount Pleasant Street at Jones Road/ King's Highway	Revise signal phasing and timings
	King's Highway at Shaw's Drive	Improve signal equipment, phasing and timing to provide concurrent pedestrian crossing
	King's Highway at Stop & Shop Drive	Pre-empt grade crossing signals Reconfigure Stop & Shop Drive to accommodate diverted Tarkiln Hill Road traffic
	Tarkiln Hill Road at Church Street	Pre-empt grade crossing signal Revise signal timing , including longer pedestrian timings
Whale's Tooth Station	Acushnet Avenue at Hillman Street	Improve crosswalks and pedestrian ramps
	Acushnet Avenue	Construct approximately 300 feet of sidewalk along east side of Acushnet Avenue
	Mill Street at Pleasant Street and Kempton Street	Revise signal timing, including longer pedestrian timings
	Coggeshall Street at North Front Street	Install traffic signal
Freetown Station	South Main Street	Construct approximately 1,600 feet of sidewalk along the east side of South Main Street
	South Main Street at Narrows Road	Improve crosswalks and pedestrian ramps
	South Main Street at Copicut Street	Improve crosswalks and pedestrian ramps
Fall River Depot Station	North Main Street at President Avenue	Widen North Main Street to provide an exclusive northbound and southbound left-turn lane Modify traffic signal phasing to provide a westbound lead phase and exclusive pedestrian phase
	President Avenue at N. Davol Street	Improve pedestrian timing
Battleship Cove Station	Broadway at Central Street	Improve crosswalks and pedestrian ramps
	Broadway at Anawan Street	Improve crosswalks and pedestrian ramps
Stoughton Station	Brock Street at Washington Street	Install traffic signal

Station	Intersection/Roadway	Mitigation
	Wyman Street at Summer Street/Morton Street	Reconstruct intersection (eliminating driveways, realign Morton St. and install stop sign).

7.4.2 Visual

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Include clear commitments to specific measures to minimize or mitigate visual impacts associated with the proposed layover facilities.

Section 4.5.5 of this FEIS/FEIR provides an overview of the visual mitigation measures that will be incorporated during preliminary and final design. The proposed visual mitigation measures include siting and designing facilities to minimize changes to the visual landscape, and minimizing vegetation removal along the right-of-way. The proposed Wamsutta layover facility site is in an industrial setting partially occupied by an existing rail yard; the new facility would not appreciably alter the visual environment. The proposed Weaver's Cove East layover facility site is an undeveloped parcel adjoining an abandoned industrial facility and across a primary surface street from a residential neighborhood. It may adversely affect the visual setting of the North Main Street District of Fall River. Mitigation measures such as screening and light minimization would be incorporated during preliminary or final design. The specific mitigation measures proposed for visual impacts are listed in Tables 7.5-1 and 7.5-2.

7.4.3 Noise

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Include a detailed mitigation plan with commitments at an appropriate level to mitigate for project-related noise impacts.

Section 4.6.3.6 of this FEIS/FEIR provides an overview of the noise mitigation measures that would be incorporated during preliminary and final design. The *Noise and Vibration Mitigation Plan* proposes noise mitigation measures at specific locations. The proposed noise mitigation measures include, for severe noise impacts, installing noise barriers at four locations that meet the MBTA's policy for a noise barrier as a mitigation measure:

- Center Street area from Main Street to Bridge Street in Easton;
- Baldwin Street area from Bridge Street to Parker Terrace in Easton;
- Murray Street area from Brightman Street to Cory Street in Fall River; and
- Almy Street area from Cory Street to President Avenue in Fall River.

For the remaining severely impacted sensitive receptor locations, building insulation is the most cost-effective noise mitigation for reducing the noise impact associated with the rail operations along the Stoughton Electric Alternative. Sound insulation would be provided where appropriate at the remaining sensitive receptor locations that would be impacted by the project. The specific mitigation measures proposed for noise impacts are listed in Tables 7.5-1 and 7.5-2.

7.4.4 Vibration

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Include a mitigation plan with clear and specific commitments to address vibration impacts and an explanation of the reductions in VdB levels expected.

Section 4.7.5 of this FEIS/FEIR provides an overview of the vibration mitigation measures that will be incorporated during the preliminary and final design process. The *Noise and Vibration Mitigation Plan* proposes vibration mitigation measures at 39 locations along the following streets:

- Stoughton:
  - Brock Street/Washington Street;
  - Rogers Drive/Plain Street; and
  - Smyth Street/Washington Street.
- Easton:
  - Center Street/Williams Street/Avis Circle/Baldwin Street;
  - Laurel Drive;
  - Short Street/Lantern Lane;
  - Kennedy Circle; and
  - Prospect Street.
- Raynham:
  - Bridge Street;
  - Elm Street West;
  - Carver Street;
  - Britton Street; and
  - Wampanoag Road/King Phillip Street/Chickering Road.
- Taunton:
  - Thrasher Street/Malcolm Circle;
  - Summer Street;
  - High Street/Paul Bunker Drive;
  - Hart Street/Alegi Avenue; and
  - Williams Avenue/Plain Street.

- Berkley:
    - Padelford Street;
    - Mill Street; and
    - Adams Lane.
- Freetown:
    - Braley Road;
    - Richmond Road;
    - Forge Road; and
    - High Street/Alexander Drive.
- New Bedford:
    - Lynn Street; and
    - Purchase Street.
- Fall River:
    - Leeward Road;
    - Rolling Green Drive;
    - North Main Street;
    - Pickering Street/Clinton Street/St. James Street;
    - Murry Street/Cory Street/Ballard Street/Almy Street/Railroad Avenue/North Court Street/Brownwell Street/Thompson Street;
    - Dyer Road;
    - Durfee Street/Cedar Street;
    - Maple Street; and
    - Meadow Street.

The proposed vibration mitigation measures include installing ballast mats under the track and using special track construction techniques such as continuously welded rails. The specific mitigation measures proposed for vibration impacts are listed in Table 7.5-1.

7.4.5 Cultural Resources

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Evaluate mitigation opportunities, including repairs and rehabilitation, for the historic train station in Stoughton;
- Expand on the analysis provided in the DEIR/S with a detailed mitigation plan for impacts to significant historic and archaeological resources; and
- Include commitments to specific mitigation measures for any impacts to cultural resources of importance to Native American Tribes.

The former Stoughton Station building is owned by the MBTA but is not part of the functioning station. The MBTA has declared the building to be surplus and offered it for sale. The Transit Realty Authority issued an Invitation to Bid in 2012, and the sale will include a protective covenant to protect the integrity of the historic building. The sale and re-use of the existing former station building is independent of the South Coast Rail project. The station building cannot be re-used as part of the relocated station, as it is not located adjacent to the proposed station.

As described in Section 4.8.5 of this FEIS/FEIR, MassDOT will develop specific cultural resources mitigation measures during the preliminary and final design process. The mitigation measures will be memorialized in a Programmatic Agreement (PA) to be developed after the FEIS/FEIR is completed, and will be executed by the USACE, MassDOT, the Massachusetts Historical Commission, and potentially other consulting parties. MassDOT will analyze specific construction sites and select mitigation measures during National Historic Preservation Act Section 106 consultation. Detailed site investigations and/or data recovery will be conducted where impacts to archaeological resources are unavoidable.

The mitigation measures that may be implemented to minimize impacts to historic resources include preparing historic archival documentation and providing interpretive signs at archaeological sites, designing stations to be compatible with the character of surrounding historic properties, and using the noise and vibration mitigation measures identified above to minimize impacts to cultural resources. The specific mitigation measures proposed for impacts to cultural resources, which are based on the draft PA, are listed in Tables 7.5-1 and 7.5-2.

7.4.6 Air Quality

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Include commitments to construction-related mitigation measures;
- Include in the mitigation plan an update on consultation with the Massachusetts Department of Energy Resources, Division of Green Communities in regard to developing a joint approach to promote energy efficiency and greenhouse gas reductions in South Coast Rail communities; and
- Describe in detail the specific commitments that MassDOT will make to contribute towards reductions in vehicle miles travelled and related greenhouse gas emissions through the proposed feeder bus system.

Section 4.9.4 of this FEIS/FEIR provides an overview of the air quality mitigation measures for construction activities that will be incorporated during preliminary and final design. The proposed air quality mitigation measures during construction are listed in Tables 7.5-1 and 7.5-2 and include requirements that contractors adhere to all applicable regulations regarding control of construction vehicle emissions, use after-engine emission controls and ultra-low sulfur diesel fuel, and control dust at construction sites. During operation, the Build Alternatives are expected to reduce air quality impacts as compared to the No-Build Alternative. MassDOT will support the feeder bus system to contribute towards reductions in vehicle miles travelled and related greenhouse gas emissions.

MassDOT has not consulted further with the DOER Division of Green Communities or utility companies at this early planning stage of the project. Selection of an Electric Alternative over a Diesel Alternative would reduce GHG emissions from the project, and the reduction of VMT which would result from the

project under any alternative would further reduce GHGs. No further GHG mitigation measures are proposed.

7.4.7 Biodiversity and Wildlife Habitat

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Include a detailed evaluation of potential mitigation measures to improve habitat connectivity by methods such as wildlife passage structures through the rail bed and improvements to stream crossings to facilitate passage of fish and wildlife designed so as not to compromise the hydrology of wetlands on either side of the rail bed;
- Propose mitigation measures for unavoidable impacts to wetland hydrology from stream crossing modifications;
- Include an analysis of spans and open bottom arches to meet the Stream Crossing Standards, and consider such arches as mitigation measures throughout the entire rail alignment to the extent they are practicable to improve fish and wildlife passage, and do not interfere with safe train operations;
- Clarify commitments to time-of-year restrictions on construction for specific fish species, or demonstrate that they may not be required if construction is located outside of the area used by diadromous species or uses methods that will not affect fish passage or use spawning riffles;
- Include time-of-year construction restrictions to protect migratory birds;
- Describe commitments to specific enhancements in the Hockomock Swamp and other areas along the rail alignment, as well as commitments to biodiversity protection through land acquisition and conservation;
- Describe proposed measures to avoid and minimize construction and train operational noise impacts during critical wildlife breeding season in spring and early summer; and
- Assess barrier effects to wildlife movement in the Acushnet Cedar Swamp and proposed scheduling and/or other measures to minimize impacts to wildlife movement during project construction and operation.

Section 4.14.3.6 of this FEIS/FEIR provides an overview of the biodiversity mitigation measures that will be incorporated during preliminary and final design. These mitigation measures include replacing bridges and culverts that connect areas of high biodiversity with structures that meet Stream Crossing Standards to facilitate fish and wildlife passage through the rail bed, constructing new wildlife crossings (such as between-rail tunnels) for turtles and amphibians, enhancing or replacing disturbed habitat, and phasing construction with time-of-year restrictions to protect species in sensitive areas during migration or breeding seasons. The specific mitigation measures proposed for impacts to biodiversity and wildlife habitat are listed in Tables 7.5-1 and 7.5-2.

7.4.8 Threatened and Endangered Species

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Explain in detail how the project will meet the long-term "net benefit" standard in 321 CMR 10.23 regarding impacts to state-listed endangered species, including detailed mitigation plans that should be developed in consultation with the Natural Heritage and Endangered Species Program.

Section 4.15.3.6 of this FEIS/FEIR provides an overview of the endangered species mitigation measures that will be incorporated during preliminary and final design. These mitigation measures include the biodiversity and wildlife habitat mitigation measures described above as well as off-site habitat protection and preservation, and funding research programs to benefit state-listed species. MassDOT has coordinated with the Natural Heritage and Endangered Species Program (NHESP) and the agencies are in agreement on the proposed mitigation measures. The specific mitigation measures proposed for impacts to threatened and endangered species are listed in Table 7.5-1.

7.4.9 Wetlands

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Propose mitigation measures that will allow the project to be conditioned to contribute to Wetland Protection Act interests. Mitigation measures will be required to off-set the project's direct, indirect, and cumulative impacts. The FEIR should describe specific mitigation measures that will directly mitigate wetland impacts, improve wetland conditions and avoid future indirect and cumulative impacts;

- Include detailed plans for Bordering Land Subject to Flooding mitigation and demonstrate how proposed mitigation will meet Wetlands Protection Act requirements;

- Provide details of mitigation plans for riverfront impacts;

- Describe how lost wetland functions and values will be mitigated;

- Evaluate opportunities to enhance wetlands near the Raynham Dog Track on the west side of the alignment as well as potential "undevelopment" and restoration of portions of the dog track site. The FEIR should identify measures that MassDOT is committed to implement; and

- Identify targeted lands for acquisition by MassDOT as mitigation for the cumulative and indirect impacts to wetlands.

The Secretary's Certificate on the 2011 DEIR also stated that the wetlands mitigation plan should include:

- A 2:1 ratio for Bordering Vegetated Wetlands mitigation (at a minimum), at least 1:1 for all other wetlands. Where the USACE requires higher ratios (e.g., for forested wetlands), the mitigation plan should reflect the federal requirements;

- At least a 2:1 mitigation of rare species impacts subject to consultation with NHESP. In some areas mitigation requirements may be considerably higher—because this is a linear project that results in habitat fragmentation and may have disproportionate impacts on some species;
- An evaluation of potential for restoration/preservation of Atlantic White Cedar (*Chamaecyparis thyoides*) wetlands;
- Meaningful Riverfront Area improvements and/or restoration to mitigate for riverfront impacts;
- On-site elevation-specific compensatory storage for lost flood storage, or if such compensatory storage cannot be provided, demonstrate an insignificant increase in flooding, demonstrate that any incremental increase in flooding could be contained on the Proponent's property, or acquire flood easements; and
- Wetland restoration within the Hockomock ACEC.

Section 4.16.10 of this FEIS/FEIR provides an overview of the wetland mitigation measures that will be incorporated during preliminary and final design. A conceptual mitigation design was prepared for each of the seven proposed wetland establishment and restoration sites. The design took into account the size, elevation, and existing conditions at each site, as well as vegetation cover types surrounding each site. These mitigation designs aim to produce wetland establishment and restoration areas that result in no net loss of wetland functions and values.

Conceptual mitigation measures proposed for impacts to wetlands are listed in Tables 7.5-1 and 7.5-2.

The amount of identified wetland establishment and restoration is greater than the amount required according the regulatory mitigation goals, to allow for changes and reductions to wetland mitigation designs where required based on field conditions. Sites identified as candidates for preservation to meet USACE mitigation requirements in excess of the 2:1 ratio wetland replacement required by MassDEP include a broad range of possible sites to ensure that opportunities for preservation can be developed once exact amounts of preservation acreage needed are known.

Wetland mitigation designs have been advanced to the same level of conceptual design as the track and stations. Final wetland mitigation designs will be developed during the subsequent final design process, after MassDOT has committed funding for project design and construction. It would be premature for MassDOT to acquire property and advance wetland mitigation at this stage of project development. MassDOT could secure options on properties for mitigation for the LEDPA once the regulatory agencies have agreed with the proposed mitigation sites.

7.4.10 Water Quality

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Clearly identify the Environmentally Sensitive Site Design and Low Impact Development measures to which MassDOT is committed to implement at the proposed stations, parking areas, and layover facilities.

Section 4.17.3.6 of this FEIS/FEIR provides an overview of the water quality and stormwater mitigation measures that will be incorporated during preliminary and final design. These mitigation measures include designing stations with ESSD and LID elements, using stormwater BMPs at stations and layover facilities, improving existing drainage ditches, installing sediment forebays and check dams, and using herbicides in accordance with a Vegetation Management Plan. Drainage from the Hockomock Swamp trestle would be managed in place through the use of infiltration trenches located at intervals beneath the trestle. Construction impacts to stormwater would be managed by a SWPPP. The specific mitigation measures proposed for impacts to water quality are listed in Tables 7.5-1 and 7.5-2.

7.4.11 Hazardous Materials

The Secretary's Certificate on the 2011 DEIR did not include any requirements for mitigation of hazardous materials.

Section 4.12.4 of the FEIS/FEIR provides an overview of the hazardous materials mitigation measures that will be incorporated during preliminary and final design. In accordance with MassDEP requirements, any materials that would be excavated from the project areas would be pre-characterized to determine course of action for removal. The specific mitigation measures proposed for hazardous materials are listed in Table 7.5-2.

7.4.12 Waterways

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Include measures to compensate for impacts to public access to the shoreline.

Work within Chapter 91 jurisdictional non-tidal rivers and streams waterways will be limited to repairing or replacing existing bridges. The South Coast Rail project is expected to maintain or improve navigability that may exist in these streams by replacing multi-span bridges with single- or double-span structures, resulting in a net benefit to public access.

As discussed in Section 4.18.4, the South Coast Rail project will not result in any adverse impacts to public access along the shoreline within Chapter 91 jurisdiction. No mitigation is required. Work within filled tidelands is limited to repair, replacement or rehabilitating existing track, ballast and culverts within filled tidelands along existing railroad rights-of-way. These improvements within existing active rail corridors will not result in any new impacts to public access to the shoreline. A portion of the Weaver's Cove East would be constructed on filled tidelands. Access to the shoreline at this location is presently restricted by the presence of the active rail corridor. The proposed layover facility will not create any new obstacles to public access to the shoreline.

7.4.13 Public Open Space

The Secretary's Certificate on the 2011 DEIR stated that the FEIR should:

- Include a detailed plan to avoid and minimize impacts and/or to mitigate unavoidable impacts to open space; and
- Quantify all open space impacted by the project and describe mitigation commitments.

Section 4.10.3.6 of the FEIS/FEIR provides an overview of the public open space mitigation measures that will be incorporated during preliminary and final design. Only a small portion of one parcel protected by Article 97 would be required for project construction. The required acquisition is a 0.16-acre portion of the 19.38-acre Stoughton Memorial Conservation Land in Stoughton in order to re-route Morton Street. MassDOT will comply with the Article 97 Land Disposition Policy in identifying and acquiring a suitable replacement property on behalf of the Stoughton Memorial Conservation Land during final design. MassDOT will coordinate with the Town of Stoughton to support acquisition of target open space properties such as those identified in the *Open Space and Recreation Plan* (April 2007) to proportionately offset impacts to the Stoughton Memorial Conservation Land. It is anticipated that any acquisitions negotiated by MassDOT and the Town of Stoughton would be consistent with the *Stoughton Community Preservation Plan, FY2012-2015* (Draft, April 2012). The *Open Space and Recreation Plan* identifies 20 parcels that abut the existing Memorial Lands that are identified as “Areas of Conservation Interest” in the Community Preservation Plan, for their ability to provide a more contiguous holding in the Memorial Land. Land acquisition to comply with the provisions of Article 97 would focus on these parcels. Identifying specific parcels is not appropriate at this stage of the project since funds have not been allocated for design and construction.

7.4.14 Environmental Justice

The Secretary’s Certificate on the 2011 DEIR stated that the FEIR should:

- Include a list of specific mitigation commitments to address noise and vibration impacts to Environmental Justice neighborhoods;
- Clarify if there will be a disproportionate impact to an Environmental Justice community with regard to traditional cultural properties, and if so, what mitigation will be implemented; and
- Specify how financial impacts to Environmental Justice communities will be mitigated.

Section 4.4.3 of the FEIS/FEIR provides an overview of the mitigation measures that will be incorporated during preliminary and final design for impacts to resources within environmental justice neighborhoods. No disproportionate impacts, including financial impacts, would occur and mitigation measures for impacts unique to environmental justice populations are not required. Mitigation measures for unavoidable impacts to environmental justice populations address noise and vibration impacts as discussed in Sections 7.4.3 and 7.4.4, above, and will be incorporated during preliminary and final design.

7.4.15 Land Use

The Secretary’s Certificate on the 2011 DEIR stated that the FEIR should:

- Explain how the Corridor Plan will be implemented in parallel with the proposed rail and station development to ensure appropriate timing of mitigation and to optimize the Smart Growth potential of the project.

Chapter 5 of the FEIS/FEIR provides a description of MassDOT’s intent to support and monitor the smart growth components of the Corridor Plan. Implementation of the Corridor Plan is not the responsibility of

MassDOT. Executive Order 525 requires state agencies to support and implement the policies of the Corridor Plan.[2]

7.5 SUMMARY OF PROJECT MITIGATION MEASURES

The proposed South Coast Rail project will result in impacts to social and natural resources, including transportation, land use, social and economic resources, visual and aesthetic resources, noise, vibration, historical and archaeological resources, protected open space and ACECs, biodiversity, threatened and endangered species, wetlands, water quality, and Chapter 91 Waterways. As documented in Chapter 4, the South Coast Rail project will have beneficial effects on transportation, environmental justice populations, regional mobility, land use, economics, air quality, and climate. Implementation of smart growth measures (such as envisioned by the Corridor Plan), as discussed in Chapter 5 will contribute to long-term benefits in land use, land protection, and economic development and will better allow corridor communities to control future sprawl. The analysis of secondary and cumulative impacts demonstrates that smart growth can contribute to additional benefits with respect to air quality and climate.

7.5.1 Permanent Impacts

Permanent impacts resulting from construction of the South Coast Rail project would be mitigated, as described in Section 7.4 and summarized in Table 7.5-1. The proposed mitigation measures will be refined during the preliminary and final design.

Table 7.5-1 Proposed Project Mitigation Measures for Permanent Impacts

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
Transportation	Improve crosswalks and pedestrian ramps at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Reconfigure driveways and roads at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Pre-empt crossing signals at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Close intersections at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Improve pedestrian timing at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Construct sidewalks at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Improve signage at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Widen streets to provide exclusive turn lanes at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Re-stripe streets at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Modify traffic signal phasing and timing at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Install traffic signals at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Improve grade crossing safety at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA

[2] Governor Deval L. Patrick. 2010. Executive Order 525: Implementation of the South Coast Rail Corridor Plan. http://www.mass.gov/governor/legislationeexecorder/executiveorder/executive-order-no-525.html.

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
	Remove gates and signals at existing crossings and replace them with new gates, signals, and signal cases at locations specified in Table 7.4-1.	During construction	MassDOT/MBTA
	Remove vegetation at all grade crossings to improve sight distance.	During construction	MassDOT/MBTA
	Coordinate with local emergency service providers regarding grade crossing design.	During design	MassDOT/MBTA
	Install fencing along right-of-way in developed areas to discourage trespassing.	During construction	MassDOT/MBTA
Visual	Install screening in selected locations.	During construction	MassDOT/MBTA
	Select station lighting fixtures, designs, and technologies that minimize night sky impacts.	During design	MassDOT/MBTA
	Install station lighting that minimizes night-sky impacts.	During construction	MassDOT/MBTA
	Design facilities and structures to blend with the surrounding landscape.	During design	MassDOT/MBTA
Noise	Provide noise walls or other noise measures where sensitive land uses would be subject to Severe impacts (if cost-effective according to MBTA and FTA criteria; e.g., less than $30,000 per dwelling unit) at four locations along the alignment in Easton and Fall River: • Center Street Area, Easton (Main St to Bridge St) • Baldwin Street Area, Easton (Bridge St to Parker Terrace) • Murray Street Area, Fall River (Brightman St to Cory St) • Almay Street Area, Fall River (Cory St to President Ave)	During construction	MassDOT/MBTA
	Provide funding for building noise mitigation where sensitive land uses would experience severe impacts but walls are not cost-effective, at a rate of $5,000 per dwelling unit per decibel of noise impact above the Severe level, up to a maximum of $30,000 for 235 residences: • 21 in Stoughton • 56 in Easton • 23 in Raynham • 23 in Taunton • 14 in Berkley • 8 in Lakeville • 25 in Freetown • 12 in New Bedford • 53 in Fall River	During construction	MassDOT/MBTA
Vibration	Incorporate vibration mitigation measures into the design and operating plan, including continuously welded rail, ballast and sub-ballast depth specifications, turnout locations at least 100 feet away from sensitive receptors, and train and track maintenance (such as regular wheel re-truing) schedules.	During design	MassDOT/MBTA

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
	Install ballast mats under the tracks at up to 39 locations as specified in Section 4.7 of this FEIS/FEIR where mitigation is justified and soil conditions are appropriate.	During construction	MassDOT/MBTA
Cultural Resources	Where impacts to historic resources are unavoidable, prepare archival documentation and provide interpretive signs that describe for the public the site's history, features, and significance	During construction	MassDOT/MBTA
	Develop and implement a Cultural Resource Monitoring Program	During design and during construction	MassDOT/MBTA
	Develop a mitigation plan, in consultation with the USACE and MHC, to minimize adverse impacts to historic properties as identified in the Programmatic Agreement.	During design	MassDOT/MBTA
	Conduct additional archaeological survey in sensitive areas as identified in the Programmatic Agreement	During design	MassDOT/MBTA
	Evaluate specific construction sites (the Route 138 Grade Separation, proposed Stoughton Station) and conduct detailed site investigations and/or data recovery where impacts to archaeological resources are unavoidable	During design and during construction	MassDOT/MBTA
	In areas where there is a potential for vibration damage to historic structures, inspect building foundations prior to construction and monitor foundations during construction	During design and during construction	MassDOT/MBTA
	Install rubber ballast mats (or equivalent) or moveable point frog turnouts (or equivalent) to minimize potential for vibration-induced damage to historic buildings in Easton	During construction	MassDOT/MBTA
	Design Easton Village Station to be compatible with character of surrounding historic properties such as the adjacent railroad station	During design	MassDOT/MBTA
	Use non-contrasting paints on fences, roadway equipment, and signal bungalows; locate signs and fixtures in a sensitive manner within and adjacent to historic properties	During construction	MassDOT/MBTA
	Within historic districts, reduce visual impacts by reducing clearing and using screening planting and landscaping	During design	MassDOT/MBTA
	Minimize number of lighting poles adjacent to historic properties; paint poles a non-contrasting color	During design	MassDOT/MBTA
Air Quality	Consult with the Massachusetts Department of Energy Resources, Division of Green Communities in regard to developing a joint approach to promote energy efficiency and greenhouse gas reductions in South Coast Rail communities	During design	MassDOT/MBTA
	If diesel alternative is selected, use plug-ins and electric block heaters at rail layover facilities	During design	MassDOT/MBTA
Biodiversity	Where possible when engineering constraints and hydrology are taken into consideration, replace bridges and culverts that connect areas of high biodiversity with structures that meet Massachusetts River and Stream Crossing Standards to facilitate fish and wildlife passage through the rail bed. Table 4.14-36 of the FEIS/FEIR lists the culverts to be reconstructed to meet stream crossing standards.	During construction	MassDOT/MBTA
	Replant disturbed areas.	During construction	MassDOT/MBTA

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
	Develop and implement an invasive species control plan within the Hockomock Swamp	During construction	MassDOT/MBTA
	Install wildlife crossings (tunnel and between-tie crossings) at the locations specified in Chapter 4.14, *Biodiversity* (Table 4.14-37)	During construction	MassDOT/MBTA
	Consider slope modifications to avoid direct impacts to vernal pools	During design	MassDOT/MBTA
	Work with the Town of Easton and Southeast Regional Vocational School to identify measures to protect vernal pools on their respective properties from ATV damage	During design	MassDOT/MBTA
	Enhance natural vegetation within buffer zones to vernal pools, where appropriate.	During design	MassDOT/MBTA
	Adhere to the approved Vegetation Management Plan (see Water Quality section of this table).	During operation	MassDOT/MBTA
Threatened and Endangered Species	Install wildlife crossings (tunnel and between-tie crossings) to maintain population continuity for state-listed wildlife, at the locations specified in Chapter 4.14, *Biodiversity*.	During construction	MassDOT/MBTA
	Provide funding or land acquisition to protect up to 25 acres of land potentially used by the Hockomock Swamp population of Blanding's turtle.	During construction	MassDOT/MBTA
	If required by NHESP in the Conservation and Management Permit, fund a study of the Hockomock Swamp population of Blanding's turtle to assist NHESP in developing long-term protective measures.	During construction	MassDOT/MBTA
	Provide funding or land acquisition to protect up to 11 acres of land potentially used by the Hockomock Swamp population of blue-spotted salamander.	During construction	MassDOT/MBTA
	Provide funding to the NHESP eastern box turtle Mitigation Bank equivalent to protecting up to 17 acres of habitat, or directly protect up to 17 acres of habitat through land acquisition or restriction.	During construction	MassDOT/MBTA
Wetlands	Create/restore up to 33.7 acres of wetlands and waterways at up to seven sites, at ratios determined in consultation with MassDEP, USACE, depending on cover type, for no net loss of wetland functions and values. See Table 4.16-62 of the FEIS/FEIR.	During design and during construction	MassDOT/MBTA
	Create/restore up to 6.7 acres of BLSF to provide compensatory flood storage, as required by the WPA Variance. See Table 4.16-61 of the FEIS/FEIR.	During design and construction	MassDOT/MBTA
	Monitor compensatory wetlands for success and invasive plant species, and implement an Invasive Species Control Plan during a post-construction monitoring period as required by the Section 404 permit.	5-10 year post construction monitoring period	MassDOT/MBTA

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
	Select and preserve wetlands and adjacent developable uplands at Priority Preservation Area sites if the area of federal wetland mitigation needed would not be fully achieved by wetland establishment, enhancement, or restoration.	During design and construction	MassDOT/MBTA
Water Quality	Improve railroad drainage system to promote settling and infiltration.	During construction	MassDOT/MBTA
	Install sediment forebays and check dams upgradient of discharge points.	During construction	MassDOT/MBTA
	Line drainage ditches within drinking water protection areas.	During construction	MassDOT/MBTA
	Design traction power substations with secondary containment structures.	During construction	MassDOT/MBTA
	Install retention ponds, rain gardens, and other treatment/control features at station sites.	During construction	MassDOT/MBTA
	Design and install stormwater management systems at layover facilities to meet stormwater management standards for LUHPPLs.	During design and during construction	MassDOT/MBTA
	Adhere to the approved Vegetation Management Plan, as implemented with MassDOT's Yearly Operating Plans, which restrict the use of herbicides in areas adjacent to wetlands or sensitive resources.	During operation	MassDOT/MBTA
Article 97	Identify and acquire replacement open space to compensate for the loss of 0.16 acre of public open space in Stoughton.	Prior to construction	MassDOT/MBTA
Land Use	Implement the Smart Growth measures of the Corridor Plan as applicable in accordance with Executive Order 525.	Prior to, during, and after construction	State agencies listed in EO 525
	Provide incentives and guidance to municipalities for Smart Growth implementation.	Prior to, during, and after construction	State agencies listed in EO 525
	Monitor Smart Growth implementation using approved performance metrics.	Prior to, during, and after construction	EOHED

7.5.2 Construction Impacts

Temporary, short-term impacts from construction activities would be mitigated to the extent practicable as summarized in Table 7.5-2. Appropriate construction mitigation measures would be incorporated into the contract documents and specifications governing the activities of contractors and subcontractors constructing elements of the proposed project. Specific mitigation measures for construction impacts would be developed during the final design phase of the South Coast Rail project and would be reviewed by the appropriate regulatory agencies as part of the permit applications. Construction-period mitigation requirements would be incorporated into the final plans and specifications that would serve as the basis for the construction contract(s).

Table 7.5-2 Proposed Project Mitigation Measures for Construction-period Impacts

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
Visual	Avoid unnecessary tree clearing along rights-of-way	During construction	MassDOT/MBTA
Noise	Maintain mufflers on construction equipment.	During construction	MassDOT/MBTA
	Keep truck idling to a minimum in accordance with MassDEP anti-idling regulations.	During construction	MassDOT/MBTA
	Fit any air-powered construction equipment with pneumatic exhaust silencers.	During construction	MassDOT/MBTA
	Prohibit nighttime construction.	During construction	MassDOT/MBTA
	Institute time-of-year construction restrictions during breeding seasons in sensitive habitat areas including the Hockomock Swamp, Pine Swamp, and Acushnet Cedar Swamp.	During construction	MassDOT/MBTA
Cultural Resources	In areas where there is a potential for vibration damage to structures, inspect building foundations prior to construction and monitor foundations during construction.	During design and during construction	MassDOT/MBTA
Air Quality	Prohibit excessive idling of construction equipment and trucks in accordance with MassDEP anti-idling regulations.	During construction	MassDOT/MBTA
	Require that all diesel equipment used on-site will be fitted with after-engine emission controls, including diesel oxidation catalysts and/or particulate filters. This would include on-road vehicles on which catalysts or filters can be accommodated.	During construction	MassDOT/MBTA
	Require use of ultra-low sulfur diesel fuel for all construction vehicles.	During construction	MassDOT/MBTA
	Provide dust protection at work sites.	During construction	MassDOT/MBTA
Biodiversity	Avoid tree clearing within the right-of-way in the Hockomock Swamp, Pine Swamp, Assonet Cedar Swamp and Acushnet Cedar Swamp from May 1 to July 15.	During construction	MassDOT/MBTA
	Observe time-of-year restrictions for in-water bridge work as identified in Table 4.14-33 of the FEIS/FEIR (generally from March 15 to June 30). Coordinate with DMF to identify restrictions that protect fish spawning in the Taunton River while allowing bridge construction.		
Threatened and Endangered Species	Install staked, entrenched siltation fencing at all limits of work within rare species habitat areas.		
	Install one-way turtle gates within areas of mapped habitat of listed turtle species (Blanding's, eastern box).		
	Daily monitoring of the work area within areas of mapped habitat of listed turtle species from spring through fall, as required by the Conservation and Management permit. Any animals found within the work area would be relocated.		
	Restrict construction in the Hockomock Swamp to daylight hours during amphibian breeding season (March-April).		
Wetlands	Implement erosion and sedimentation control measures according to a Soil Erosion and Sediment Control Plan.	During construction	MassDOT/MBTA

Environmental Categories	Mitigation Measure	Implementation Schedule	Implementation Responsibility
Water Quality	Develop and implement a comprehensive Soil Erosion and Sediment Control Plan in accordance with NPDES and MassDEP standards.	During construction	MassDOT/MBTA
	Apply water to dry soil to prevent dust production.	During construction	MassDOT/MBTA
	Stabilize any highly erosive soils with erosion control blankets and other stabilization methods, as necessary.	During construction	MassDOT/MBTA
	Use sediment control methods (such as silt fences and hay bales), during excavation to prevent silt and sediment entering the stormwater system and waterways.	During construction	MassDOT/MBTA
	Maintain equipment to prevent oil and fuel leaks.	During construction	MassDOT/MBTA
	Design a construction-phase SWPPP that incorporates the following: Erosion and sediment controls Spill control procedures Proper handling of dewatering discharges	During construction	MassDOT/MBTA
Hazardous Materials and Solid Waste	Prepare Hazardous Materials and Solid Waste Management Plan, and Health and Safety Plan, to describe the regulatory context and procedures to be used during construction.	During design	MassDOT/MBTA
	Pre-characterize any materials that would be managed during the project to determine the course of action for excavation and disposal.	During construction	MassDOT/MBTA
	Pre-characterize construction materials in buildings that would be demolished to identify special or hazardous waste and determine the course of action for removal and disposal.	During construction	MassDOT/MBTA

8 REGULATORY COMPLIANCE

8.1 INTRODUCTION

In addition to complying with the NEPA and the MEPA, a number of state and federal permits are needed for the proposed South Coast Rail project. Table 8.1-1 lists the required state and federal permits, determinations, and approvals. All listed agencies also participate in the environmental review of the project through the NEPA and/or MEPA processes. In addition to being presented in a consolidated manner in this chapter they are also discussed in the resource chapters. This chapter focuses on the regulatory compliance of the Stoughton Electric Alternative as the Preferred and LEDPA.

Table 8.1-1 Required Permits and Approvals

Issuing Agency	Approval or Permit
U.S. Army Corps of Engineers	Clean Water Act, Section 404 Individual Permit
	Section 10 of the Rivers and Harbors Appropriation Act of 1899
U.S. Environmental Protection Agency	Clean Water Act, Section 402 National Pollutant Discharge Elimination System, General Permit for Construction Activities & Multi-Sector General Permit for Industrial Activities
U.S. Coast Guard	Section 9 of the Rivers and Harbors Appropriation Act of 1899 and the General Bridge Act of 1946
Massachusetts Office of Coastal Zone Management	Coastal Zone Management Act, Federal Consistency Certification
Massachusetts Executive Office of Energy and Environmental Affairs	Public Benefits Determination
Massachusetts Department of Environmental Protection	Massachusetts Wetlands Protection Act Variance
	Massachusetts Public Waterfront Act (Chapter 91) License(s)
	Clean Water Act, Section 401 Water Quality Certificate Variance
Massachusetts Department of Fish and Game	Massachusetts Endangered Species Act Conservation and Management Permit

The Secretary's Certificate on the DEIR included the following regulatory compliance requirements:

- The project will require several variances from Wetlands regulations performance standards. One of the three criteria for a variance is a demonstration that the variance is necessary to accommodate an overriding public interest. The FEIR should further refine how the proposed Stoughton Electric rail will advance the public interests identified in the DEIR/DEIS.

- To demonstrate eligibility for a variance MassDOT must also propose mitigation measures that will allow the project to be conditioned to Wetland Protection Act interests.

- The FEIR should include a comprehensive description of how MassDOT proposes to meet MESA regulatory requirements, including the standards for authorizing a take of a state-listed species through a Conservation and Management Plan.

- The FEIR should expand upon the evaluation in the DEIR/DEIS to demonstrate consistency with EEA Article 97 Land Disposition Policy.

- The FEIR should identify permits required for layover facilities and document how the proposed facilities will comply with applicable regulatory requirements. Consistency with Chapter 91 licensing requirements and requirements for location within a Designated Port Area (DPA) should be described as applicable.

- The FEIR should describe how the project will comply with the Massachusetts Stormwater Standards for work proposed in wetland resource areas and buffer zones pursuant to 310 CMR 10.05(6)(k) and 314 CMR 9.06(6), as well as other state and federal requirements (including Total Maximum Daily Load [TMDL] requirements) for stormwater discharges to existing outfalls and/or for the proposed layover facilities.

- The FEIR should include an assessment of the ability of the proposed project to meet the ten Massachusetts Stormwater Standards or specify if a variance to the standards specified at 310 CMR 10.05(6)(k) and 314 CMR 9.06(6) may be required.

- The FEIR should describe in detail how the project will meet licensing standards at 310 CMR 9.54 and 9.55 (for non-water-dependent) and 301 CMR 9.31-9.40 (for water dependent).

The following sections describe the required permits and approvals for the South Coast Rail project, and how the project complies with each.

8.2 CLEAN WATER ACT SECTION 404

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with the federal Clean Water Act[1] Section 404 permit program.

8.2.1 Regulatory Context

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into "Waters of the United States," including adjacent wetlands. The South Coast Rail project would require the issuance of a Section 404 Individual Permit (i.e., would not be eligible for the Massachusetts Programmatic General Permit) as it would result in the loss of more than 1 acre of waters of the United States.

On May 8, 2008, MassDOT submitted an application to the USACE for Individual Permit authorization under the Section 404 program.

8.2.2 Regulatory Requirements

Fill activities are evaluated using the USEPA's Guidelines for Specification of Disposal Sites for Dredged or Fill Material promulgated pursuant to Section 404(b)(1) of the Clean Water Act[2] (Section 404(b)(1) Guidelines). The Section 404(b)(1) Guidelines are designed to avoid unnecessary filling of special aquatic sites, which are defined as:

[1] Formally, the Federal Water Pollution Control Act.
[2] 40 CFR 230 *et seq*.

"Geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region."[3]

Wetlands and riffle and pool complexes are both categories of special aquatic sites. The Guidelines state that "all practicable alternatives to the proposed discharge [of dredged or fill material], which do not involve a discharge into a special aquatic site, are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise." As described in 40 CFR 230.10 (with some exceptions),

- No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences;
- No discharge of dredged or fill material shall be permitted if it:
  - Causes or contributes to violations of any applicable State water quality standard;
  - Violates any applicable toxic effluent standard or prohibition;
  - Jeopardizes the continued existence of species listed as endangered or threatened or results in the destruction or adverse modification of designated critical habitat; or
  - Violates any requirement to protect any designated marine sanctuary;
- No discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States; and
- No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.

8.2.3 Regulatory Compliance

This section describes how the South Coast Rail project would comply with the four Section 404(b)(1) Guidelines listed above.

8.2.3.1 Practicable Alternatives

Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose. The practicability of the alternatives is considered by the USACE in determining whether there is a less environmentally damaging practicable alternative to that which is proposed.

The overall project purpose is used by the USACE to evaluate whether there are less environmentally damaging practicable alternatives available. The overall project purpose for the South Coast Rail project

[3] 40 CFR 230.3(q-1)

is defined by the USACE as: “to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, MA, and to enhance regional mobility.” This definition is specific enough to define MassDOT’s needs, but not so restrictive as to constrain the range of alternatives that must be considered under the Section 404(b)(1) Guidelines.

Chapter 3, *Alternatives*, describes the range of alternatives considered for the South Coast Rail project and identifies the Stoughton Electric Alternative as the recommended LEDPA. There are no less environmentally damaging practicable alternatives that meet the overall project purpose. The evaluation of the environmental impacts of the alternatives is provided in Chapter 4, *Affected Environment and Environmental Consequences*, and Chapter 5, *Indirect Effects and Cumulative Impacts*.

8.2.3.2 Water Quality

The South Coast Rail project has been designed by MassDOT to comply with Massachusetts Stormwater Standards. The project includes proposed stormwater management systems to minimize impacts to water quality by controlling runoff velocities and removing pollutants from the stormwater runoff discharging from the railroad bed, layover facilities, and station locations to downstream surface water resources. Due to the potential impacts to Outstanding Resource Waters (ORWs), the project would require a variance from the state water quality standards (Clean Water Act Section 401), as described in Section 8.8 of this chapter.

8.2.3.3 Threatened and Endangered Species

Section 7 of the Endangered Species Act requires Federal agencies to consult with the Secretary (of the Interior or Commerce Departments; generally as represented by the Fish and Wildlife Service and the National Marine Fisheries Service [NMFS], respectively) on any action that is likely to jeopardize the continued existence of a species listed or proposed for listing on federal threatened and endangered species lists. The South Coast Rail project would not affect any federally listed endangered species, because there are none within the action area. Since the publication of the DEIS, Atlantic sturgeon (*Acipenser oxyrinchus*; NY Bight population) has been listed as federally endangered. The Taunton River “mouth” is specifically named in the Federal Register listing (FR77-5912, Feb 6, 2012). Although the Taunton River crossings are upstream of the river mouth, the Corps contacted the NMFS to inquire about the possible effects of South Coast Rail on this species. NMFS has determined that “no species listed under [their] jurisdiction are likely to be exposed to any direct or indirect effects of the proposed project.” Therefore, no further Section 7 consultation is required.

8.2.3.4 Waters and Wetlands

The Section 404(b)(1) Guidelines stipulate that “no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States.” Measures to protect and avoid impacts to wetlands and water resources were incorporated into the conceptual design. Construction practices (such as use of BMPS) would be implemented in accordance with state and federal guidelines to prevent unnecessary impacts to wetland and water resources. Unavoidable impacts would be mitigated.

Avoidance was considered along the South Coast Rail project corridor when designing track layout at the current conceptual level. Tracks were kept within the existing railbed footprint where possible. Complete avoidance is only possible through the No-Build Alternative, which does not achieve the project purpose and need. Minimization was achieved through structures such as retaining walls to reduce grading of slopes where the existing railroad embankment was widened. Single track design was

used wherever possible to minimize widening of the right-of-way. Special construction techniques, such as retaining walls to minimize the lateral extent of the project footprint and the Hockomock Trestle to pass over the Hockomock Swamp, have been incorporated into the design of the Stoughton Alternative to minimize adverse impacts to wetlands.

For the Stoughton Electric Alternative, a total of just over 1 acre of palustrine emergent wetlands would be permanently impacted, requiring 2.1 acres of mitigation. A total of 0.9 acre of palustrine scrub-shrub wetlands would be permanently impacted, requiring 1.8 acres of mitigation. A total of 8.5 acres of palustrine forested wetlands would be permanently impacted, requiring 25.5 acres of mitigation. A total of 1.9 acres of open water would be permanently impacted, requiring 1.9 acres of mitigation. An additional 2.4 acres of temporary impacts to palustrine forested wetlands would require mitigation. Mitigation would seek to replace the functions and values lost due to wetland impacts. During final design, a comprehensive assessment of functions and values would be performed onsite including wildlife habitat assessments, in order to refine the information on functions and values provided by wetlands along the project corridor.

8.3 CLEAN WATER ACT SECTION 402

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with the Clean Water Act Section 402 requirements.

8.3.1 Regulatory Context

Section 402 of the Clean Water Act regulates the discharge of pollutants to surface waters. Under the National Pollutant Discharge Elimination System (NPDES) program that is authorized by Section 402, owners and operators of point source discharges and certain non-point discharges (such as stormwater runoff) are required to obtain a permit prior to discharging. The NPDES program includes both General and Individual Permits. The General Permit for Construction Activities regulates erosion control, pollution prevention, and stormwater management at construction sites over 1 acre. A Multi-Sector General Permit for Industrial Activities is appropriate for operations at sites such as the proposed South Coast Rail layover facilities, and regulates discharges of site-specific pollutants. An Individual Section 402 Permit is not required for the South Coast Rail project.

8.3.2 Regulatory Requirements

Two types of permits would be required to construct and operate the South Coast Rail project. The NPDES General Permit for Construction Activities requires construction contractors to prepare a Stormwater Pollution Prevention Plan (SWPPP) that describes the BMPs that will be implemented to minimize or eliminate discharges of pollutants from construction sites. A NPDES Multi-Sector General Permit for Industrial Activities would establish site-specific conditions that must be met by the site operator, and also include SWPPP requirements.

8.3.3 Regulatory Compliance

This section describes how the South Coast Rail project would comply with the NPDES General Permit for Construction Activities requirements and the Multi-Sector General Permit for Industrial Activities to address stormwater dischargers from each of the proposed layover facilities.

MassDOT would prepare a Notice of Intent (NOI) to request authorization for coverage of the South Coast Rail project under the NPDES General Permit for Construction Activities. A SWPPP would be developed by the construction contractor that specifies proper stormwater management procedures for any disturbed areas. Construction period impacts to water quality would be reduced or eliminated through the use of appropriate BMPs that would be documented in the SWPPP. The BMPs would include perimeter sedimentation controls (silt fence, hay bales, filter berms, siltation booms), temporary stabilization of disturbed areas, and temporary siltation basins where appropriate. The SWPPP would be completed during the final design phase and is required to be implemented by the project contractor.

MassDOT would also prepare a NOI to request authorization for coverage under the Multi-Sector General Permit for Industrial Activities for each of the proposed layover facilities. Both of the layover facilities have been conceptually designed to meet Massachusetts Stormwater Standards, and further refinement would be made during preliminary and final design. A site-specific SWPPP would be completed for each facility that provides an assessment of potential sources of pollutants in stormwater runoff and control measures that will be implemented at the layover facility to minimize the discharge of these pollutants in runoff from the site. These control measures include site-specific BMPs, maintenance plans, inspections, employee training, and reporting.

8.4 SECTION 10 OF THE RIVERS AND HARBORS ACT OF 1899

Section 10 of Rivers and Harbors Appropriation Act of 1899, (33 U.S.C. 403) requires a Department of the Army permit for structures and/or work in or affecting navigable waters of the United States. In the case of South Coast Rail, the Taunton River is a tidal navigable water of the United States up to the South Street East Bridge in Taunton, and the Mill River in Taunton is navigable to Spring Street in Taunton. Should the South Coast Rail proposal involve any placement of structures or work (except bridges) in or affecting the Taunton or Mill Rivers, it will be necessary for MassDOT to obtain Department of the Army authorization under Section 10, in addition to the authorization to discharge dredged or fill material under Section 404 of the Clean Water Act. On May 8, 2008, MassDOT applied for a Department of the Army permit and that application is accepted pursuant to Corps' authority under both Section 10 and 404.

The Corps does not have authority over bridges under the Rivers and Harbors Act of 1899, as that authority has been delegated to the U.S. Coast Guard (see below). Corps authority over bridges is limited to appurtenant structures such as abutments and bank stabilization, the construction of which may involve discharges of dredged or fill material, and as such are regulated under Section 404 of the Clean Water Act.

8.5 COASTAL ZONE MANAGEMENT ACT

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with federal Coastal Zone Management Act requirements and the Massachusetts Coastal Zone Management Standards and Policies.

8.5.1 Regulatory Context

Section 307(c) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)) requires federal agencies conducting activities, including development projects, directly affecting a state's coastal zone, to comply to the maximum extent practicable with an approved state coastal zone management

program. The Act also requires any non-federal applicant for a federal license or permit to conduct an activity affecting land or water uses in the state's coastal zone to furnish a certification that the proposed activity will comply with the state's coastal zone management program. Generally, no permit will be issued until the state has concurred with the non-federal applicant's certification.

The Massachusetts Coastal Zone Management Plan (CZMP) and regulations implement the federal Coastal Zone Management Act. The Coastal Zone Management Act established federal statutory authority to manage the nation's coastal resources in order to balance economic development with environmental conservation. The Massachusetts Coastal Zone Management Act established local authority to implement the Massachusetts CZMP.

8.5.2 Regulatory Requirements

The following CZM regulations are applicable to the South Coast Rail project:

- 301 CMR 21.00 requires a federal consistency certification issued by the Office of Coastal Zone Management for projects in the coastal zone deemed likely to affect the coastal zone and that require a federal action.
- 301 CMR 23.00 establishes state procedures for the preparation of Municipal Harbor Plans. Approved plans provide municipalities a mechanism for modifying certain requirements of Chapter 91 Licensing.
- 301 CMR 25.00 establishes state authority to delineate DPAs within the coastal zone to protect the unique capacity of developed ports and port infrastructure to support water-dependent industrial activities.

These regulations, in concert with the Waterways Regulations (310 CMR 9.00), create a regulatory framework for planning, licensing and implementing projects in the Massachusetts Coastal Zone. The South Coast Rail project includes track, stations and layover facilities within the Massachusetts Coastal Zone and would require compliance with these regulations.

8.5.3 Regulatory Compliance

The following subsections describe how South Coast Rail project elements within the Massachusetts Coastal Zone and DPAs comply with applicable water quality policies, and the DPA regulations.

8.5.3.1 Compliance with Water Quality Policies

Compliance with state water quality policies is a requirement for federal consistency under the CZMP and 301 CMR 21.98. This regulation establishes the CZMP’s programmatic policies and management principles which form the basis for federal consistency. Three water quality policies are applicable to the South Coast Rail project.

Water Quality Policy #1

Ensure that point-source discharges in or affecting the coastal zone are consistent with federally approved state effluent limitations and water quality standards.

Table 8.5-1 lists the applicable state and federal water quality regulations regarding point-source, nonpoint-source, and subsurface discharges at proposed stations and layover facilities. The South Coast Rail project has been designed to meet these environmental protection requirements through compliance with all applicable federal and state regulations governing sources of air and water pollution and wetland protection.

Water Quality Policy #2

Ensure that nonpoint pollution controls promote the attainment of state surface water quality standards in the coastal zone.

Compliance with the NPDES General Permit for Construction Activities would be achieved as described in Section 8.3.3; compliance with the Wetlands Protection Act stormwater regulations is described in Section 8.7.

Table 8.5-1 Water Quality Regulations

Law or Regulation	Program	Applicable?	Compliance
310 CMR 10.05(k)	Massachusetts Wetlands Protection Act: Stormwater Regulations	Applicable to all track, stations and layover facilities within 100 feet of state-regulated wetlands.	MassDOT would seek a Variance under the Wetlands Protection Act for wetland alteration but will comply with all applicable stormwater regulations. See Section 8.7.
314 CMR 3.00	Surface Water Discharge Permit Program	No	The project does not include any discharges to waters of the Commonwealth.
314 CMR 4.00	Surface Water Quality Standards	No	No discharges to surface water are proposed.
314 CMR 5.00	Groundwater Discharge Program	No	No discharges of pollutants to groundwater are proposed.
314 CMR 9.00	Clean Water Act Section 401 Water Quality Certification	The South Coast Rail project will require an Individual Water Quality Certificate.	The project would be designed and constructed in compliance with the Water Quality Certificate. See Section 8.8.
33 USC 1342 (Clean Water Act)	NPDES General Permit for Construction Activities	Yes	MassDOT would submit an NOI requesting authorization for stormwater discharges under the General Permit for Construction Activities. See Section 8.3.
	NPDES Multi-Sector General Permit for Industrial Activities	Yes	MassDOT would submit and NOI requesting authorization for stormwater discharges under the Multi-Sector General Permit for operations at the proposed layover facilities. See Section 8.3.
	NPDES Remediation General Permit (RGP)	TBD	An application for coverage under the RGP would be submitted as needed to authorize the collection, treatment and discharge for groundwater from applicable sites containing oil and hazardous materials.

Water Quality Policy #3

Ensure that activities in or affecting the coastal zone conform to applicable state requirements governing sub-surface waste discharges and sources of air and water pollution and protection of wetlands.

A summary of compliance with each of these conditions is provided below.

Subsurface Waste Discharges

The South Coast Rail project does not include any subsurface waste discharges.

Air Pollution

The South Coast Rail project would result in a net reduction in air pollution and a net benefit to regional air quality as described in detail in Chapter 4.9, *Air Quality.* The Stoughton Electric Alternative would not result in any direct project emissions from the locomotives, layover facilities, or stations. Motive power and electric service to proposed stations and layover facilities would be supplied by existing electric generating facilities with adequate capacity to serve the project without requiring expansion.

The South Coast Rail project would comply with the Clean Air Act Amendments (CAAA) and the Executive Office of EEA policy on greenhouse gas emissions, and is not anticipated to require any new local, state, or federal permit related to air pollution.

Water Pollution

The South Coast Rail project would meet all applicable local, state, and federal requirements regarding potential water pollution, and MassDOT would obtain all needed permits under these regulations as described in Table 8.5-1. No point source discharges are proposed. All stormwater collected at stations and layover facilities would be treated in accordance with the Massachusetts Stormwater Regulations and in accordance with applicable NPDES discharge requirements.

Wetland Protection

The South Coast Rail project would protect state and federally regulated wetlands by adherence to all applicable regulations. The project has been designed to avoid, minimize, and mitigate wetland impacts to the greatest extent practicable and are subject to permit requirements under Section 404 of the federal Clean Water Act, the Massachusetts Wetlands Protection Act, and Section 401 of the Clean Water Act (Water Quality Certificate), as described in Sections 8.2, 8.7, and 8.8, respectively.

8.5.3.2 Compliance with Designated Port Area Regulations

Massachusetts regulations at 301 CMR 25.00 establish state authority to delineate DPAs within developed industrial waterfronts. The purpose of delineating DPAs is to identify geographic areas of particular state, regional and national significance with respect to the promotion of commercial fishing, shipping and other vessel-related activities associated with water-bourne commerce, and of manufacturing, processing, and production activites.

The South Coast Rail project includes track work in the the Mount Hope Bay (Fall River) and New Bedford/Fairhaven DPAs. The only South Coast Rail project elements within these DPAs are the following existing track segments:

- Mount Hope Bay
  - Reconstruct 2,000 + LF of track south of the proposed Weaver's Cove East Layover Facility

- Reconstruct 500 + LF of track north of the proposed Battleship Cove Station

- New Bedford/Fairhaven

  - Reconstruct 500 + LF of track south of the proposed Wamsutta Layover Facility

The project-related work proposed within these DPAs is the reconstruction of existing track, ballast, and associated infrastructure. The South Coast Rail project has been designed to avoid construction of stations and layover facilities within the DPAs.

The CZM regulations include port and harbor infrastructure policies and management principles for projects located in the Massachusetts Coastal Zone. Two policies and management principles are applicable to the South Coast Rail project.

Ports Policy #3

Preserve and enhance the capacity of DPAs to accommodate water-dependent industrial uses, and prevent the exclusion of such uses from tidelands and any other DPA lands over which a state agency exerts control by virtue of ownership, regulatory authority or other legal jurisdiction.

Reconstructing the existing track, ballast and related infrastructure would result in a direct benefit to the DPAs' capacity to support water-dependent industrial uses by improving the railroad transportation infrastructure serving these ports. The South Coast Rail project would improve the freight transportation capacity on the New Bedford Main Line from Taunton to the Port of New Bedford and on the Fall River Secondary to Fall River. These improvements would improve the capacity of the DPAs to support water-dependent industrial uses without developing land within the DPAs for non-water dependent uses.

Ports Management Principle #1

Encourage, through technical and financial assistance, expansion of water dependent uses in designated ports and developed harbors, re-development of urban waterfronts, and expansion of visual access.

The proposed improvements within the Mount Hope Bay (Fall River) and New Bedford/Fairhaven DPAs will provide substantial financial assistance to these ports by replacing and upgrading existing rail infrastruture. These upgrades will substantially improve the load capacity of the existing tracks serving these ports, increasing the capacity for the DPAs to serve as as sea/land intermodal freight node and improve their potential to serve water-dependent industrial uses. The South Coast Rail project has been designed to avoid the construction of any non-water dependent use facilities within the DPAs while substantially improving transportation infrastructure.

The proposed track reconstruction will not adversely affect public views of the shoreline because the work is limited to the reconstruction of existing at-grade railroad infrastructure. No new stations or layover facilities are proposed in any DPA.

8.6 MASSACHUSETTS PUBLIC BENEFITS DETERMINATION

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with requirements to obtain a Public Benefit Determination.

8.6.1 Regulatory Context

Portions of the South Coast Rail project are subject to the requirements of Chapter 168 of the Acts of 2007[4] because they are located on landlocked filled tidelands. The South Coast Rail project exceeds review thresholds as defined in 301 CMR 11.03 and would require a Public Benefit Determination by the Secretary of the Executive Office of EEA in accordance with the regulations at 301 CMR 13.00. Projects subject to MEPA are required to consider potential impacts on groundwater and, in cases where projects are located in areas of known low groundwater, include measures to avoid, minimize, or mitigate potential impacts.

8.6.2 Regulatory Requirements

When making a Public Benefit Determination, the Secretary is required to consider the:

- Purpose and effect of the development;
- Impact on abutters and the surrounding community;
- Enhancement of the property;
- Benefits to the public trust rights in tidelands or other associated rights;
- Community activities on the development site;
- Environmental protection and preservation;
- Public health and safety, and
- General welfare.

The Secretary is also instructed by 301 CMR 13.00 to consider the differences between tidelands, landlocked tidelands and great ponds when assessing the public benefit and shall consider the practical impact of the public benefit on development.

8.6.3 Regulatory Compliance

The South Coast Rail project elements proposed within landlocked tidelands have been sited and preliminarily designed to protect the public interests in tidelands and result in public benefits. The project would result in substantial net benefits to the public interest in filled tidelands by revitalizing and expanding public infrastructure in a manner which meets all applicable state and federal environmental protection standards while minimizing potential impacts to abutters to these sites and the community.

The project elements that are located on filled tidelands, located at least 250 feet landward of existing flowed tidelands, and are completely separated from flowed tidelands by one or more intervening roads are:

- Battleship Cove Station,
- Whale's Tooth Station, and

[4] An Act Relative to Licensing Requirements for Certain Tidelands: Section 8, Chapter 168 of the Acts of 2007.

- Wamsutta Layover Facility.

The following sections describe how these project elements would provide public benefits and are adequately protective of the public's inherent rights in present and former waterways, held in trust by the Commonwealth for the benefit of the public.

8.6.3.1 Battleship Cove Station

The Battleship Cove Station would be a new station constructed at the southern terminus of the Fall River Secondary, on Water Street in Fall River. The station would be a platform-only station that would operate during peak hours. It would serve downtown Fall River and the Battleship Cove tourist area. The site is approximately 825 feet from the nearest flowed tidelands of the Taunton River. A portion of the site is located on filled tidelands entirely separated from the flowed tidelands by Water Street. The public benefits of the proposed Battleship Cove Station are described below.

Purpose and Effect of the Development

The purpose of the Battleship Cove Station is to provide new passenger rail access to the Fall River downtown and tourist waterfront area, improving access to the MBTA and regional public transportation network. The station would be accessible to passengers walking, biking, or driving to the station.

The effects of the development would be:

- Creation of a new public transportation facility providing regional commuter rail service to downtown Fall River and the Battleship Cove area where none presently exists; and
- Construction within approximately 10,000 square feet of filled tidelands for the platform.

Impact on Abutters and Community

The Battleship Cove Station is expected to be a net benefit to abutting properties and the Fall River community. Adverse impacts to abutters are expected to be minimal because the adjacent private uses are light commercial/industrial and warehousing. Beneficial impacts to the community would result from revitalizing the existing rail infrastructure and providing a new transportation link to the regional MBTA system. There would be no impact on the existing Ponta Delgada Monument and plaza.

Enhancement of the Property

The Battleship Cove Station would enhance the site by rehabilitating the existing rail infrastructure along this section of the Fall River Secondary and activating the property for public transportation use.

Benefits to the Public Trust Rights in Tidelands or Other Associated Rights

The Battleship Cove Station would benefit public trust rights in filled tidelands at the site by providing new access to the planned passenger rail network and adjacent land. The site contains an open grassy landscaped area adjacent to the Ponta Delgada Monument and plaza, and is open to the public. Access to these areas would not be affected by the station.

Community Activities on the Site

The Battleship Cove Station would increase community activities at the site by providing new access to the regional rail transportation network. The MBTA estimates that approximately 240 passengers would use the station on a daily basis.

Environmental Protection/Preservation

The Battleship Cove Station would meet all local, state, and federal environmental protection and preservation requirements and comply with all applicable regulations.

Public Health and Safety

Providing passenger rail service to the Battleship Cove Station and adjacent downtown Fall River area would result in net benefits to public health and safety resulting from a reduction in single passenger vehicle trips, air pollution, and regional traffic.

General Welfare

The Battleship Cove Station would promote the general welfare by providing new public access to the proposed regional transportation system. MassDOT would use public funds to provide direct and tangible benefits to the residents and visitors in the Battleship Cove area. The station has been designed to promote use by local residents. The potential for traffic impacts has been mitigated by limiting the number of parking spaces at the station site to the required handicapped-accessible spaces only, and by promoting pick-up/drop-off and local bus connections.

Protection of Groundwater

The Battleship Cove Station site is not within an area of known low groundwater, and would not have any adverse impacts to the existing groundwater conditions. The station would be a platform constructed essentially at-grade. No subsurface construction such as a basement, extensive excavation, or groundwater cut-off wall are proposed and no short- or long-term impacts to groundwater are anticipated.

8.6.3.2 Whale’s Tooth Station

Whale’s Tooth Station would be a new train station constructed in New Bedford. It would be located near the intersection of Acushnet Avenue and Hillman Street, near the southern terminus of the New Bedford Main Line. The City of New Bedford has constructed a parking lot on the approximately 14-acre site in anticipation of the South Coast Rail project.

The majority of the Whale’s Tooth Station would be located on landlocked filled tidelands because the station site is entirely separated from the mean high water mark of New Bedford Harbor by interconnected public ways and is at least 250 feet landward of the mean high water mark. The public benefits of the proposed Whale’s Tooth Station are described below.

Purpose and Effect of the Development

The purpose of the Whale’s Tooth Station is to provide new passenger rail access to the New Bedford downtown waterfront area, improving access to the MBTA and regional public transportation network. The station would be adjacent to an existing City of New Bedford parking lot and would be accessible to passengers walking, biking, or driving to the station.

The effects of the development would be:

- Creation of a new public transportation facility providing commuter rail service to the downtown New Bedford area; and
- Activation of filled tidelands for public use for construction of the proposed station and vehicle circulation areas.

Impact on Abutters and Community

The Whale's Tooth Station would result in minimal adverse impacts to abutters and a net benefit to the New Bedford community. Adjacent properties consist primarily of a highway, industrial and trucking properties, vacant land and the Greater New Bedford Career Center; none of these existing uses are likely to be disrupted either by construction or operation of the station.

The New Bedford community at large would benefit by gaining short-term construction related jobs and long-term improved access to the regional transportation network.

Enhancement of the Property

The Whale's Tooth Station would enhance the property by providing new public transportation infrastructure adjacent to an existing paved parking lot.

Benefits to the Public Trust Rights in Tidelands or Other Associated Rights

The Whale's Tooth Station would provide a net benefit to the public trust rights in filled tidelands at the site by providing new access to the planned passenger rail network. The proposed station would enhance the public's use of the landlocked tidelands by increasing utilization of the site and providing access to additional regional transportation options.

Community Activities on the Site

The Whale's Tooth Station would increase community activities at the site by increasing utilization of the existing 14-acre paved parking facility.

Environmental Protection/Preservation

The Whale's Tooth Station construction would meet all local, state and federal environmental protection and preservation requirements and comply with all applicable regulations.

Public Health and Safety

Providing passenger rail service to the site and the downtown New Bedford area would result in net benefits to public health and safety resulting from a reduction in single passenger vehicle trips, air pollution, and regional traffic.

General Welfare

The Whale's Tooth Station would promote the general welfare by providing area residents with new public access to the proposed regional transportation system. MassDOT would use public funds to provide direct and tangible benefits to the residents and visitors to New Bedford. The station's proximity to Route 18 and existing local bus services would take advantage of the existing road network, reducing potential adverse transportation impacts that could result from the South Coast Rail project. The 14-

acre surface parking lot constructed by the City of New Bedford at the site would minimize potential impacts to parking in the vicinity of the site.

Protection of Groundwater

The Whale's Tooth Station site is not within an area of known low groundwater, and would not have any adverse impacts to the existing groundwater conditions. The station would be a single platform constructed at grade. No subsurface construction such as a basement, extensive excavation or groundwater cut-off walls are proposed and no short- or long-term impacts to groundwater are anticipated.

8.6.3.3 Wamsutta Layover Facility

The Wamsutta Layover Facility would be constructed near the southern terminus of the New Bedford Main Line, near the intersection of Wamsutta Street and Herman Melville Boulevard. This location is just north of the Whale's Tooth Station site described above. A portion of the site is currently an active CSX rail yard used for freight. The existing and proposed rail yard is located on top of a capped hazardous waste landfill.

The Wamsutta Layover Facility would be entirely within landlocked tidelands because the site is entirely separated from the water sheet of New Bedford Harbor by Herman Melville Boulevard (a public way in existence on January 1, 1984) and it is located at least 250 feet from the existing mean high water mark.

The public benefits of the proposed Wamsutta Layover Facility are described below.

Purpose and Effect of the Development

The purpose of the Wamsutta Layover Facility is to provide an overnight storage site for equipment needed for the early morning trains departing from New Bedford for Boston. Making use of a terminal layover facility avoids the need to run empty equipment to Boston for overnight storage and then back to New Bedford in the morning for the first northbound train. This would reduce fuel consumption, operation and maintenance costs, and potential environmental impacts with extra late night and early morning trains.

Potential impacts to the community are expected to be minimal because the proposed site is currently an active CSX freight rail yard located along the waterfront in an area dominated by commercial, industrial, and warehouse properties. No air quality effects are anticipated because the preferred rail alternative would use electric motive power. No diesel locomotives or power generation is proposed at the facility.

Impact on Abutters and Community

The Wamsutta Layover Facility would have minimal adverse impacts to abutters, a net benefit to the New Bedford community, and a substantial benefit to abutters in other communities along the New Bedford Main Line and the Stoughton Line. Adverse impacts to abutters are expected to be minimal because the site is currently used as an active freight rail yard and construction would be limited.

The Wamsutta Layover Facility would result in a net benefit to each community adjacent to the New Bedford Main Line and the Stoughton Line because the layover facility would eliminate the need to shuttle empty passenger trains, reducing the potential for noise impacts to these communities.

Enhancement of the Property

The proposed Wamsutta Layover Facility would marginally enhance the property by replacing one rail use with another.

Benefits to the Public Trust Rights in Tidelands or Other Associated Rights

The Wamsutta Layover Facility would improve the capacity of the site to protect the public trust rights in filled tidelands by converting a private freight rail yard to a public transportation facility. As a matter of public safety, the existing use precludes public access for any purpose. While the proposed facility would also prohibit public access to these filled tidelands, the change in use would benefit trust rights in these lands by providing a vital transportation infrastructure facility.

Community Activities on the Site

The Wamsutta Layover Facility would not increase community activities at the site because all public access with continue to be prohibited as a matter of public safety.

Environmental Protection/Preservation

The Wamsutta Layover Facility construction and operation would meet all local, state, and federal environmental protection and preservation requirements and comply with all applicable regulations.

Public Health and Safety

The cap for the soils containing oil and hazardous materials present at the site would remain in place under the Wamsutta Layover Facility. The site would be fenced and lighted to further protect public health and safety. Additionally, siting an overnight layover facility at the New Bedford Main Line terminus would eliminate the need to shuttle empty trains, reducing the potential for noise impacts.

General Welfare

The Wamsutta Layover Facility would promote the general welfare by activating the filled tidelands at the site for a public purpose and reducing extra train trips which would otherwise be required, resulting in fewer potential environmental impacts and substantial saving in fuel and operations and maintenance costs for the life on the project.

Protection of Groundwater

The Wamsutta Layover Facility is not within an area of known low groundwater, and would not have a discernible impact on groundwater because the location is a capped hazardous materials disposal site that is designed to prevent infiltration of surface runoff to groundwater.

8.7 MASSACHUSETTS WETLANDS PROTECTION ACT

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with requirements of the Massachusetts Wetlands Protection Act.

8.7.1 Regulatory Context

The South Coast Rail project would require a Variance under the Wetlands Protection Act pursuant to 310 CMR 10.05(10), subject to approval by the MassDEP Commissioner. The Commissioner may waive certain regulations when mitigating measures are proposed that would allow the project to be

conditioned so as to contribute to the public interests in wetlands. The project would also be required to meet Wetlands Protection Act stormwater standards, or require a waiver if certain standards could not be met.

8.7.2 Regulatory Requirements

The South Coast Rail project would not meet the Wetlands Protection Act performance standards for any of the wetland resource areas affected by the project because the proposed project would exceed the area (acreage) thresholds for alteration, would result in short- or long-term impacts to the habitat of state-listed rare wildlife species, and would not provide compensatory mitigation in strict accordance with the performance standards for Bordering Vegetated Wetland (BVW) or, potentially, other resource areas.

MassDOT would seek a variance under the Wetlands Protection Act, in accordance with 310 CMR 10.05(10), for wetland alteration and would comply with all applicable stormwater regulations. This section describes the applicable variance criteria and stormwater management standards.

The Wetlands Protection Act regulations establish performance standards for work proposed within the wetland resource areas, and require review of any work proposed within 100 feet of a wetland resource to determine if that work will result in the alteration of wetland resources. "Alteration" is defined to "include a change in vegetation, hydrology, or water quality of the wetland."

Three criteria of the Wetlands Protection Act regulations (310 CMR 10.05) must be met to grant a Variance request:

- Demonstrate that there are no reasonable conditions or alternatives that would allow the project to proceed in compliance with the wetlands regulations;
- Propose mitigation measures that will allow the project to be conditioned so as to contribute to the protection of the interests identified in the Wetlands Protection Act; and
- Demonstrate that the variance is necessary to accommodate an overriding community, regional, state or national public interest, or that it is necessary to avoid an Order that so restricts the use of property as to constitute an unconstitutional taking of property without compensation

8.7.3 Regulatory Compliance

The Stoughton Alternative would comply with the Wetlands Protection Act Variance criteria and stormwater standards, as described below.

8.7.3.1 Variance Criteria

The project would directly impact wetlands as a result of reconstructing the existing active and inactive rail lines. In some cases, it is necessary to widen the existing berm where sections of multiple tracks are planned. Retaining walls, regraded existing slopes, and replaced or upgraded culverts and bridges will all have permanent and/or temporary impacts on wetlands.

The Stoughton Electric Alternative would impact 9.6 acres of BVW, exceeding the 5,000-square foot threshold of area of alteration to BVW and requiring the Commissioner of MassDEP to issue a variance

from the performance standards of the Wetlands Protection Act regulations. The variance regulation allows performance standards to be waived if the following three criteria are met.

Criterion 1: There are no reasonable conditions or alternatives that would allow the project to proceed in compliance with 310 CMR 10.21 through 10.60.

An extensive alternatives analysis was undertaken for the South Coast Rail project, as described in Chapter 3. Seven alternatives were examined to determine whether they could meet the project purpose and would be practicable to construct and operate. Six of the alternatives were dismissed from further consideration because they could not meet the project purpose and/or would not be practicable to construct and operate. MassDOT has identified the Stoughton Alternative as the Preferred Alternative, and was directed by the Executive Office of Energy and Environmental Affairs to advance the Stoughton Electric Alternative. This alternative best meets the project purpose and would be practicable to construct and operate.

None of the alternatives considered could be constructed in strict compliance with the Wetlands Protection Act regulations; all of the alternatives would have unavoidable impacts to wetland resource areas that would exceed the relevant performance standards in 310 CMR 10.21 through 10.60, as documented in Chapter 4.16, *Wetlands*. As noted above, the Stoughton Electric Alternative would impact 9.6 acres of BVW, well in excess of the 5,000 square foot threshold.

Although the loss of wetlands has and will continue to be minimized through preliminary and final design, there are no reasonable conditions that would allow the project to proceed in compliance with these regulations due to the length of the corridor and the proximity of wetlands to the railbed.

Criterion 2: Mitigating measures are proposed that will allow the project to be conditioned so as to contribute to the protection of the interests identified in M.G.L. c.131, §40.

Proposed mitigation measures are described in Chapter 7, *Proposed Mitigation Measures and MassDOT Proposed Section 61 Findings*, as well as in Chapter 4.16, *Wetlands*. In summary, wetland restoration or establishment at up to seven potential sites is proposed to meet state 2:1 mitigation goals by providing mitigation of at least:

- 19.2 acres of wetlands to offset impacts to BVW;
- 1.9 acres of wetlands to offset impacts to land under water (LUW); and
- 6.7 acres of wetlands or compensatory flood storage to offset impacts to bordering land subject to flooding (BLSF). Final design of BLSF mitigation will also assess the volume of compensatory storage to be provided.

While the areas under consideration for mitigation are larger than the required mitigation, MassDOT would commit to constructing the amount of mitigation necessary to satisfy the required mitigation goals. At the current level of design for the project, mitigation plans are not sufficiently accurate to determine the amount of wetland establishment that is practicable in a given area and will likely change when detailed field conditions are evaluated. The proposed mitigation plans cover larger areas than are required and allow for changes or reductions in the area of wetland mitigation from unknown site constraints.

MassDOT would further refine the mitigation measures during preliminary and final design. The proposed wetland mitigation plan identifies specific locations to serve as suitable wetland resource mitigation areas, demonstrates its ability to successfully replicate wetland functions and ecological values, and provides wetland mitigation at a ratio of 2:1 or greater.

In addition, a list of potential wetland preservation sites has been developed to identify candidates for wetland preservation to address USACE-specific mitigation requirements of state requirements. Wetland preservation is one of a suite of mitigation options to meet the USACE-specific mitigation requirements, in addition to the wetland establishment and restoration discussed above.

Criterion 3: The variance is necessary to accommodate an overriding community, regional, state or national public interest; or that it is necessary to avoid an Order that so restricts the use of the property as to constitute an unconstitutional taking without compensation.

Regulation 310 CMR 10.05(10) provides that the Commissioner may waive the application of the regulations if it is found "that the variance is necessary to accommodate an overriding community regional, state or national public interest ..." This first element of the criterion requires a showing that the project is being pursued by, or under the auspices of, a public authority or a private entity found to be serving a public function. Since the MBTA is pursuing this project, the first element of this test is met in that the applicant is a public entity pursuant to MGL Chapter 161A, Section 2.

The second element of this criterion requires that the applicant show that the project is one of such unusual merit or necessity in serving a public interest that it overrides MassDEP's interest in enforcing its wetland regulations. The public interest served by the Stoughton Electric Alternative is that it would address the need for public transportation from the South Coast region to Boston and provide benefits to the South Coast region in terms of public transit equity, service distribution and ridership, air quality and climate change improvements, and opportunities for smart growth and sustainable development as an alternative to sprawl.

This FEIS/FEIR documents the need for transportation improvements in the South Coast region (see Chapter 2, *Purpose and Need*). The South Coast Rail project is an initiative of MassDOT and the MBTA who have defined its purpose as "to more fully meet the existing and future demand for public transportation between Fall River/New Bedford and Boston, and to enhance regional mobility, while supporting smart growth planning and development strategies in affected communities." The need for the project establishes the public benefits that would be met. The current transportation system serving the South Coast region is inadequate to meet the current needs of the region and will not meet the future demand placed upon it, as indicated by increasing traffic congestion and accidents. Major transportation needs and deficiencies that would be addressed by the South Coast Rail project include:

- Lack of transportation capacity to downtown Boston;
- Congestion on highway and transit facilities serving the region; and
- Air quality that does not meet federal Clean Air Act standards.

Overriding public interests that arise from these from a MEPA perspective include:

- Improving regional air quality;

- Adding transportation capacity between Fall River, New Bedford, and downtown Boston;
- Reducing congestion on highway and transit facilities;
- Improving travel times;
- Improving regional mobility;
- Improving access to jobs;
- Providing equity to Environmental Justice populations; and
- Promoting smart growth planning.

The commuter rail would increase the number of travelers that would choose to use public transit for work trips from the South Coast to Boston and Cambridge and reduce the vehicle miles of travel by automobiles. The improvements to public transportation services in the South Coast Rail corridor are consistent with regional goals that envision diversion of auto trips to transit, and rely on improved transit services to provide more attractive and lower-impact travel choices to peak period travelers as the regions highway system becomes increasingly congested due to the growth in automobile travel.

Transportation benefits of the proposed commuter rail line include a reduction in automobile trips to access transit (since feeder bus service would provide rides to new stations and current South Coast residents accessing commuter rail in Stoughton will be able to walk to or make a shorter trip to closer stations); fewer side trips made by automobile commuters during the day since they would not be driving their cars; and diversion of commuters from automobile or other transit services that would reduce the demand for parking in downtown Boston and at major transit stations.

Air quality would benefit from the South Coast Rail project, as described in Chapter 4.9. Vehicle miles traveled (VMT) would be reduced as commuters shift travel mode from private automobiles to public transit, reducing emissions from cars. The electric motive power of the trains would not emit air pollutants, and emissions from remote power plants to produce the electric power would be lower than those of diesel-powered trains. The mode shift would also reduce greenhouse gas emissions, with less of an impact on climate than the No-Build Alternative.

The project would also support smart growth development, reducing sprawl as compared to the No-Build Alternative. The new station locations were selected in part to support TOD, and station sites are near development blocks. The Corridor Plan outlines measures that the municipalities served by the South Coast Rail may take, with support from the Commonwealth, to promote smart growth development in selected areas and preserve open space in other areas. The Commonwealth will support municipalities through incentives and technical assistance. Executive Order 525 directs state agencies to implement Corridor Plan when making decisions affecting the South Coast region.

On November 8, 2002, MassDEP issued a Variance under its Wetlands Protection Act regulations for the Greenbush Project. Like the proposed South Coast Rail project, the 2002 project was undertaken to improve the regional transportation system. The reasoning behind the 2002 MassDEP Variance Decision remains current and applicable to the South Coast Rail project now proposed, even though the South Coast Rail project is not a component of the State Implementation Plan (SIP, for air quality). The 2002 MassDEP Variance Decision for the Greenbush Project concluded that:

> *"In sum, the proposed project has demonstrated an overriding public interest because it will provide additional transit services in the South Shore region, reduce automobile use and vehicle miles traveled, and allow for compliance with the [Central Artery/Tunnel] commitments and the SIP."*

As MassDEP has found in this previous Variance, transit improvements constitute an overriding public need. The South Coast Rail project would improve transit and therefore serves an overriding public interest.

8.7.3.2 Stormwater Management Standards

The Stoughton Alternative is currently at a conceptual level of design. The preliminary designs for the track, stations, and layover facilities have been developed to demonstrate that the project would comply with the MassDEP Stormwater Management Standards. During the final design, each element of the South Coast Rail project would be developed in full compliance with the Standards. Based on the current level of design, the Standards and how the South Coast Rail project would comply with each one are provided below.

Standard 1: No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

BMPs proposed upgradient from any new discharge have been designed in accordance with the Massachusetts Stormwater Handbook and provide the required treatment volume. All proposed stormwater outlets and conveyances have been designed to not cause erosion or scour to wetlands or receiving waters.

Standard 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

Stormwater BMPs with volume storage are proposed at each location where post-development peak discharges would require attenuation. Sites with discharges to coastal waters (Fall River Depot Station, Battleship Cove Station, Whale's Tooth Station, Weaver's Cove East Layover Facility, and Wamsutta Layover Facility) may waive this standard and are not required to incorporate attenuation structures.

Standard 3: Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Groundwater recharge requirements would be met for each project element. Environmentally Sensitive Site Design (ESSD) techniques and LID features have been incorporated into the conceptual design of each station site and layover facility. ESSD techniques include reducing impervious area by removing unnecessary pavement, maintaining existing drainage patterns, and maintaining existing mature vegetation. LID features include disconnecting runoff from impervious surfaces, using sheet flow and

surface conveyances instead of closed drainage systems, and promoting groundwater recharge through bioretention and infiltration basins.

Standard 4: Stormwater management systems shall be designed to remove 80 percent of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long- term pollution prevention plan, and thereafter are implemented and maintained;
- Structural stormwater BMPs are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
- Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

Structural practices such as deep sump catch basins with hoods, oil/grit separators, and gravel and grass filter strips have been incorporated as appropriate in each site design in order to provide pretreatment of stormwater flows. Bioretention swales, bioretention basins, and infiltration basins have been incorporated as appropriate in each site design to provide treatment that meets or exceeds the 80 percent TSS removal requirement.

The only location where the water quality volume and 80 percent TSS removal requirement would not be met is along the Hockomock Swamp Trestle. Runoff from the trestle would be treated to the extent practicable and would meet all of the requirements of the *de minimis* standard described in Volume 3 of the Massachusetts Stormwater Handbook.

In order to comply with the on-going requirements of this standard, a long-term SWPPP would be included as part of the final design.

Standard 5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Three sites qualify as Land Uses with Higher Potential Pollutant Loads (LUHPPLs): North Easton Station, Weaver's Cove East Layover Facility, and Wamsutta Layover Facility. These sites incorporate structural stormwater BMPs such as deep sump catch basins with hoods, oil/grit separators and sediment forebays. The layover facilities also incorporate drip pans beneath the layover tracks to catch drips or spills from the trains stored at the facility.

Appropriate source control and pollution prevention measures must be documented in a post-construction SWPPP. This plan would be completed in conjunction with the NOI for authorization of stormwater discharges under the NDPES Multi-Sector General Permit for Industrial Activities, prior to stormwater discharges from the layover facilities.

Standard 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area, if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

Stormwater discharges to ORWs would receive treatment and would be set back from the receiving water to the maximum extent practicable. Discharges to ORWs are limited to locations along the Hockomock Swamp Trestle and along track segments located near vernal pools. No discharges are proposed within a Zone 1 or Zone A of a public water supply. Appropriate treatments for each location would be selected during final design as part of detailed grading plans and drainage analysis.

Standard 7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

All but three of the station sites (North Easton Station, Taunton Depot Station, and Freetown Station) and both of the layover facilities qualify as redevelopment projects. The station sites where new parking lots are proposed (Raynham Park and Taunton) and the Weaver's Cove East Layover Facility have been designed to fully comply with all of the stormwater standards.

Standard 8: A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The project would obtain coverage under the NPDES General Permit for Construction Activities prior to the start of earthmoving activities. A construction-period SWPPP would be developed during final design as part of the NOI submittal. Recommended construction period BMPs are described in Chapter 4.17 of this FEIS/FEIR.

Standard 9: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

MassDOT would develop a detailed Operations and Maintenance Plan (O&M Plan) during final design as part of the NOI submittal.

Standard 10: All illicit discharges to the stormwater management system are prohibited.

Proposed stations and layover facilities have been designed so that they are in full compliance with current standards. In locations where previous development has occurred, storm drainage structures remaining from those developments would be removed within the redevelopment area. New sanitary facilities at the two layover facilities would be designed in accordance with the sanitary code.

8.8 CLEAN WATER ACT SECTION 401—MASSACHUSETTS CLEAN WATER ACT

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with requirements of Section 401 of the Clean Water Act as administered by MassDEP under the Massachusetts Clean Water Act and implementing regulations.

8.8.1 Regulatory Context

Section 401 of the Clean Water Act (33 U.S.C. 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a certification from the state in which the discharge originates or would originate, that the discharge would comply with the applicable (i.e., Commonwealth of Massachusetts) effluent limitations and water quality standards.

Under the Clean Water Act, MassDEP is required to issue Water Quality Certifications for projects that result in discharge of fill to a wetland or waterbody, pursuant to the Massachusetts Clean Water Act (MGL Ch. 21 § 26-53). MassDEP executes its responsibilities pursuant to Section 401 under the Massachusetts Clean Water Act (M.G.L. c 21 §§ 26-53) and is the final arbiter as to whether a water quality certification will be issued, denied, or waived. The Order of Conditions issued by local conservation commissions automatically assumes the issuance of a water quality certificate for projects impacting less than 5,000 square feet of wetlands. This project would require MassDOT to obtain an Individual Water Quality Certificate from MassDEP as impacts would exceed 5,000 square feet. However, because the project cannot meet two performance criteria, as described in Section 8.8.3, MassDOT will seek a Variance from certification.

8.8.2 Regulatory Requirements

Massachusetts regulations[5] cover construction, operation, and maintenance of activities related to dredged or fill material within waters of the United States within the Commonwealth of Massachusetts, and discharge of waters to wetlands and waterways subject to state and federal jurisdiction if a NPDES permit is required for a project. Any activity that would result in a discharge of dredged material, dredging, or dredged material disposal greater than 100 cubic yards that is also subject to federal regulation under Clean Water Act Section 404 must obtain a Clean Water Act Section 401 Water Quality Certification.

There are seven criteria for the evaluation of applications for discharge of dredge or fill material (314 CMR 9.06):

[5] 314 CMR 9.00, 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters of the United States Within the Commonwealth. http://www.mass.gov/dep/service/regulations/314cmr09.pdf, accessed 28 June 2012.

- No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem;

- No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which would minimize potential adverse impacts to the bordering or isolated vegetated wetlands or land under water, including a minimum of 1:1 restoration or replication of isolated or bordering wetlands;

- No discharge of dredged or fill material shall be permitted to ORWs, except for the activities specified in 314 CMR 9.06(3)(a) through (I), which remain subject to an alternatives analysis and other requirements of 314 CMR 9.06;

- Discharge of dredged or fill material to an ORW specifically identified in 314 CMR 4.06(1)(d) (e.g., vernal pools, within 400 feet of a water supply reservoir and any other area so designated) is prohibited as provided therein unless a variance is obtained under 314 CMR 9.08;

- No discharge of dredged or fill material is permitted for the impoundment or detention of stormwater for the purposes of controlling sedimentation or other pollutant attenuation;

- Stormwater discharges shall be provided with BMPs to attenuate pollutants and provide a set back from receiving water or wetland; and

- No discharge of dredged or fill material shall be permitted in the rare circumstances where the activity meets the criteria for evaluation but would result in substantial adverse impacts to the physical, chemical, or biological integrity of surface waters of the Commonwealth.

8.8.3 Regulatory Compliance

The Stoughton Alternative would comply with five of the seven criteria outlined above for the discharge of dredged or fill material within waterways or wetlands.

- As described in Section 8.2.3.1 of this chapter, there are no practicable alternatives to the Stoughton Electric Alternative that would have less adverse impact on aquatic ecosystems.

- As described in Chapter 7.3, all appropriate and practicable steps have been taken to minimize adverse impacts to bordering or isolated vegetated wetlands and land under water. The proposed mitigation measures described in Section7.4.9 include the creation or restoration of up to 89 acres of wetlands at up to seven sites, at ratios determined in consultation with MassDEP, USACE, and the EPA, depending on cover type, for no net loss of wetland functions and values. Additionally, MassDOT will select and preserve wetlands at Priority Preservation Area sites if the area of federal wetland mitigation needed would not be fully achieved by wetland establishment and restoration.

- As described in Chapter 4.17, *Water Resources*, stormwater discharges would be managed in accordance with Massachusetts Stormwater Management Regulations. No dredged or fill material would be discharged into wetlands for the impoundment or detention of stormwater for the purposes of controlling sedimentation or other pollutant attenuation.

- Also as described in Chapter 4.17, stormwater discharges would be provided with BMPs to attenuate pollutants and would be set back from receiving waters and wetlands, in accordance with Massachusetts Stormwater Management Regulations.

- The South Coast Rail project would not result in substantial adverse impacts to the physical, chemical, or biological integrity of surface waters of the Commonwealth.

The Stoughton Alternative would require fill in ORWs (vernal pools) and would not meet either of the performance standards prohibiting the discharge of dredged or fill material in ORWs. This alternative would also require fill in wetlands associated with Fall Brook, a public water supply ORW. MassDOT would seek a Variance from Clean Water Act Section 401 Certification, in accordance with 314 CMR 9.08, for placement of fill into ORWs. The MassDEP Commissioner may issue a Variance of the criteria for evaluation of Section 401 Certification applications if the applicant demonstrates that:

- All reasonable measures have been proposed to avoid, minimize, and mitigate adverse effects on the environment; and

- The Variance is justified by an overriding public interest or necessary to avoid a certification that so restricts the use of property as to constitute an unconstitutional taking without compensation.

The MassDEP Commissioner may consolidate variance decisions under 314 CMR 9.00 (Section 401 Certification regulations), 310 CMR 10.36 and 10.58 (Wetlands Protection Act regulations), and 310 CMR 9.21 (Waterways regulations). These criteria are met pursuant to the description of the Variance from Wetlands Protection Act regulations provided in Section 8.7.3.1. The proposed project avoids impacts to the extent practicable, has minimized impacts, will mitigate for unavoidable wetland impacts, and serves an overriding public interest.

8.9 MASSACHUSETTS PUBLIC WATERFRONT ACT LICENSE (CHAPTER 91)

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with requirements of the Massachusetts Public Waterfront Act, as codified in MGL Chapter 91.

8.9.1 Regulatory Context

Chapter 91 is the Commonwealth's primary tool for protection and promotion of public use of its tidelands and other waterways. The South Coast Rail project would require approvals under the waterways licensing program of Chapter 91 and the waterways regulations at 310 CMR 9.00 for construction, reconstruction, minor modifications to existing structures, changes in use of filled tidelands and culvert and bridge replacement within non-tidal rivers and streams. No work is proposed within flowed tidelands.

Chapter 91 Sections 1 through 63 require a waterways license, issued by MassDEP, for work on or use of fill or structures within the geographic jurisdiction of Chapter 91. That jurisdiction extends to:

- All waterways of the Commonwealth subject to tidal action;

- All filled tidelands up to and including the historic high water mark, except for landlocked tidelands as defined by Chapter 168 of the Acts of 2007; and
- Navigable portions of non-tidal rivers and streams upon which public funds have been spent for channel improvement, flood control, or stream clearance.

8.9.2 Regulatory Requirements

Chapter 91 regulations at 310 CMR 9.31 establish minimum licensing standards for projects requiring a new Waterways license under Chapter 91. They include the following:

- **Basic Requirements**—The regulations at 310 CMR 9.31 establish the basic licensing requirements for all projects subject to Chapter 91. This regulation requires compliance with all applicable standards contained in 310 CMR 9.32 through 310 CMR 9.40.
- **Proper Public Purpose Requirements**—The regulations at 310 CMR 9.31(2) require MassDEP to determine that all projects requiring a Waterways license meet a proper public purpose which provides greater benefit than detriment to the inherent public rights in said land. Water Dependent Use projects are assumed by 310 CMR 9.31(2)(a) to meet this standard. Non-water dependent use projects must comply with the standards at 310 CMR 9.51 through 310 CMR 9.55, as applicable to demonstrate they serve a proper public purpose.

The South Coast Rail project includes 22 locations where the track crosses a non-tidal river or stream subject to the jurisdiction of Chapter 91, and are therefore considered infrastructure crossing facilities per 310 CMR 9.02. The proposed Weaver's Cove East Layover Facility is also subject to licensing under Chapter 91 because it meets the regulatory definition of an infrastructure facility provided in 310 CMR 9.02.

8.9.3 Regulatory Compliance

This section describes the South Coast Rail project elements subject to licensing or other Chapter 91 approvals, their water dependency and provides a summary of how each would comply with the applicable waterways regulations at 310 CMR 9.00 and the municipal harbor planning process described at 301 CMR 23.00. The Stoughton Alternative includes existing track, ballast, and drainage structures located within filled tidelands subject to jurisdiction under 310 CMR 9.04(2), and bridges and culverts crossing non-tidal rivers and streams subject to jurisdiction under 310 CMR 9.04(1)(e). Many of the existing bridge crossings are presently licensed under Chapter 91. The smaller stream crossings are generally not licensed. The proposed Weaver's Cove East Layover Facility is also not yet licensed under Chapter 91.

8.9.3.1 Infrastructure Crossing Facilities

The South Coast Rail project includes 22 bridges or culverts that span a Chapter 91 jurisdictional water body from one bank to the opposite bank.[6] These crossings therefore meet the regulatory definition of infrastructure crossing facilities provided in 310 CMR 9.02. Table 8.9-1 summarizes the proposed bridge and culvert replacements that would be subject to Chapter 91.

[6] The bridge over the Taunton River at MP 34.73 crosses a small cove along the west side of the river and does not span the river itself.

Table 8.9-1 Proposed Bridge and Culvert Replacement Subject to Chapter 91

Waterbody	Presently Licensed	Proposed Alteration	Anticipated Chapter 91 Application
Pequit Brook	No	No change to historic arch structure. Addition of second track, expansion of footprint over waterway, no change in navigability.	New License
Beaver Meadow Brook	No	No change to abutment location. New structure proposed above or adjacent to existing historic arch.	New License
Whitman Brook	No	New abutments would be constructed behind existing abutments, which would then be removed.	Maintenance
Black Brook (CV-ST 10.95)	No	Replacement of existing culvert, not presently designed.	Maintenance
Unnamed tributary to Black Brook (CV-ST 11.59)	No	Replacement of existing culvert, not presently designed.	Maintenance
Black Brook (CV-ST 12.68)	No	New bridge would be constructed to replace washed out culvert.	New License (if deemed navigable)
Unnamed tributary to Pine Swamp Brook (CV-ST 16.00)	No	Replacement of existing culvert, not presently designed.	Maintenance
Pine Swamp Brook (CV-ST 17.37)	No	Replacement of existing culvert, not presently designed.	Maintenance
Taunton River	Lic. 3118 Oct. 19, 1906	Reconstruction of existing crossing outside existing structure, removal of existing abutments.	New License or License Amendment
Taunton River	Lic. 3118 Oct. 19, 1906	Existing piles to be replaced by one mid-stream concrete pier. New abutments to be constructed outside existing structure which would then be removed.	New License or License Amendment
Taunton River	Lic. 2909 Nov. 1, 1904	Existing piles to be replaced by one mid-stream concrete pier. New abutments to be constructed outside existing structure which would then be removed.	New License or License Amendment
Mill River	Lic. 3118 Oct. 19, 1906	Reconstruction of existing crossing outside existing structure, removal of existing abutments.	New License or License Amendment
Taunton River	Yes	Bridge replacement: existing piles would be removed and one new cast-in-place concrete pier would be constructed in the center span. New abutments would be constructed behind existing abutments which would then be removed.	New License
Unnamed tributary to Cotley River (CV-NB 14.52)	No	Replacement/expansion of existing culvert.	New License
Cotley River	No	Bridge replacement: New abutments would be constructed behind the existing abutments, which would then be	New License

Waterbody	Presently Licensed	Proposed Alteration	Anticipated Chapter 91 Application
		removed.	
Cotley River	No	Bridge replacement: New abutments would be constructed behind the existing abutments, which would then be removed.	New License
Unnamed tributary to Cedar Swamp River (CV-NB 17.89)	No	Replacement of existing culvert, not presently designed.	Maintenance
Assonet River	No	Bridge replacement: existing piles to be replaced by one mid-stream concrete pier. New abutments to be constructed outside existing structure which would then be removed.	New License
Cedar Swamp River	No	New abutments would be constructed behind the existing abutments, which would then be removed.	New License
Unnamed tributary to Fall Brook	No	Replacement of existing culvert, not presently designed.	Maintenance
Fall Brook	No	Bridge replacement: new abutments would be constructed behind existing abutments, which would then be removed.	Minor modification
Unnamed (CV-NB 26.96)	No	Replacement of existing culvert, not presently designed.	Maintenance

The 22 locations where the track crosses a non-tidal river or stream subject to the jurisdiction of Chapter 91 meet the regulatory definition of Infrastructure Crossing and must comply with three Chapter 91 licensing requirements (water dependence, public purpose, and reconstruction) as well as the basic requirements, as described in the following subsections.

Water Dependence

Pursuant to 310 CMR 9.12(d), infrastructure crossing facilities may be determined to be water dependent by MassDEP only upon a finding by the Secretary that such facilities cannot be located away from such waters. The Stoughton Alternative includes use of existing railroad corridors which require numerous bank-to-bank crossings of jurisdictional non-tidal rivers and streams. A range of alternatives were previously considered and all would require numerous non-tidal river and stream crossing to extend passenger rail service as dictated by the project.

MassDOT has requested that the Secretary determine that all existing and proposed bank-to-bank rail crossings of jurisdictional non-tidal rivers cannot be relocated away from inland waters, authorizing MassDEP to find them to be water dependent pursuant to 310 CMR 9.12(2)(b).

Public Purpose

310 CMR 9.31(2) requires projects on tidelands and Great Ponds to serve a proper public purpose which provides greater benefit than detriment to the rights of the public. Water-dependent use projects are presumed to meet this requirement under the provisions of 310 CMR 9.31(2)(a). All of the existing and

proposed infrastructure crossing facilities over non-tidal rivers and streams are presumed to meet this standard.

Proposed Reconstruction

As listed in Table 8.9-1, new Chapter 91 Licenses are anticipated where there would be substantial structural alteration (enlargement) of an existing exempt structure to accommodate a second track. New or amended licenses would be required when there would be substantial structural alteration to an existing structure in terms of size, configuration, materials and design and fabrication parameters, but the number of tracks would not change. Reconstructing structures would be considered “maintenance” where it includes replacement of an existing exempt structure needed to restore the serviceability of existing railroad infrastructure without substantial enlargement.

Basic Requirements

The list below provides the applicable Basic License Requirements referenced in 310 CMR 9.31(1) and identifies the standards that apply to the proposed non-tidal river and stream crossings listed in Table 8.9-1 and provides a rationale for compliance. Only standards applicable to the South Coast Rail project are included.

310 CMR 9.31(1)(a): No new fill is permitted in flowed tidelands for non-water dependent use projects.

All existing and proposed South Coast Rail crossings are water dependent infrastructure crossing facilities pursuant to 310 CMR 9.02 and 310 CMR 9.12(2)(d).

310 CMR 9.31(1)(b): Projects must comply with all applicable state environmental protection requirements.

The South Coast Rail project would obtain all required state and federal permits and approvals.

310 CMR 9.31(1)(c): Projects must comply with applicable local zoning and Municipal Harbor Plans (MHPs).

Section 8.9.3.3 describes the South Coast Rail project’s consistency with local economic plans and MHPs. Although two South Coast Rail project elements (Wamsutta Layover Facility and Whale’s Tooth Station) are within an MHP area, they are not subject to Chapter 91 licensing as they would be located on landlocked filled tidelands.

310 CMR 9.31(1)(d): This standard prohibits projects from significantly interfering with:

- Public rights of navigation which exist in all waterways;
- Free passage over and through the water; and
- Access to town landings.

Existing culverts along the South Coast Rail corridor crossing non-tidal rivers and streams provide limited navigation. The existing bridges are generally licensed structures and provide passage for small vessel navigation. Proposed culvert and bridge improvements would maintain or enhance existing navigability at jurisdictional crossings.

310 CMR 9.31(1)(e): The project shall preserve the availability and suitability of tidelands, Great Ponds and other waterways that are in use for water-dependent purposes, or which are reserved primarily as locations for maritime industry or other specific types of water-dependent use. The project shall not significantly interfere with littoral or riparian property owners' rights to approach their property from a waterway and to approach the waterway from said property.

The South Coast Rail project does not include any new non-tidal river and stream crossings and therefore would not significantly interfere with any littoral or riparian property owners' rights of access. Existing crossings would be maintained or upgraded to support passenger rail traffic. Where feasible, upgrades would widen culverts to improve wildlife passage resulting in a net benefit to navigation.

310 CMR 9.31(1)(e): The project shall not significantly disrupt any water-dependent use in operation, as of the date of license application, at an off-site location proximate to the vicinity of the project site.

The South Coast Rail project would enhance the capacity for the existing water-dependent infrastructure crossing facilities to support public transportation and this public service project.

310 CMR 9.31(1)(e): The project shall not displace any water-dependent use that occurred on the site within the last five (5) years.

The existing South Coast Rail railroad crossings are all located on land owned and/or operated as a railroad for many years. The project would restore, maintain or enhance these existing water-dependent infrastructure crossing facilities.

8.9.3.2 Infrastructure Facility

The proposed Weaver's Cove East Layover Facility is the only project infrastructure facility potentially subject to licensing under Chapter 91. This facility meets the regulatory definition in 310 CMR 9.02:

> *"Infrastructure Facility means a facility which produces, delivers, or otherwise provides electric, gas, water, sewage, transportation, or telecommunications services to the public."*

The Weaver's Cove East Layover Facility compliance with applicable Chapter 91 licensing requirements is provided below.

Water Dependency

The Weaver's Cove East Layover Facility would be a non-water dependent infrastructure facility, as defined by 310 CMR 9.55. This facility does not meet the regulatory criteria at 310 CMR 9.12(2) defining water-dependent use projects because it does not require access to or located in tidal or inland waters.

MassDEP has confirmed that the Weaver's Cove East Layover Facility would be subject to licensing under 310 CMR 9.55 (Standards for Nonwater-Dependent Infrastructure Facilities.)

Public Purpose

310 CMR 9.31(2) requires projects on tidelands and Great Ponds to serve a proper public purpose which provides greater benefit than detriment to the rights of the public. Non-water dependent projects are reviewed under the requirements of 310 CMR 9.31(2)(b).

The Weaver's Cove East Layover Facility would comply with the requirements of 310 CMR 9.55 and the additional standards contained in 310 CMR 9.54, and is consistent with the applicable programmatic policies and management principles of the Massachusetts CZMP, which is described in Section 8.5.

Standards for Non-Water Dependent Infrastructure Facilities

The regulations at 310 CMR 9.55 waive the provisions of 310 CMR 9.51 through 310 CMR 9.53 for non-water dependent infrastructure facilities. The regulations at 310 CMR 9.55(1) requires projects to include mitigation and/or compensation measures as deemed appropriate by MassDEP to ensure that all feasible measures are taken to avoid or minimize detriments to water-related interest of the public.

The proposed Weaver's Cove East and Wamsutta layover facilities meet the definition of non-water dependent use infrastructure facilities and are therefore potentially subject to 310 CMR 9.55. The proposed Wamsutta Layover Facility would be constructed on landlocked filled tidelands and would not be subject to licensing. The proposed Weaver's Cove East Layover Facility would be located on filled tidelands and is subject to licensing and review under 310 CMR 9.55.

The public interests protected by 310 CMR 9.55(1) and listed below describe how the proposed Weaver's Cove East Layover Facility would comply with each.

Protection of Maritime Commerce, Industry, Recreation and Associated Public Access

The proposed Weaver's Cove East Layover Facility site is undeveloped and does not provide public access to the shoreline due to the presence of the existing Fall River Secondary rail corridor. The site is separated from the Taunton River by the Fall River Secondary and does not support any maritime commerce or industry.

Protection, Restoration, and Enhancement of Living Marine Resources

The proposed layover facility is located on filled tidelands approximately 100 feet from the Taunton River shoreline and approximately 20 feet above the river. Since it was filled between 1865 and 1893, the site does not support the protection, restoration or enhancement of living marine resources.

Attainment of Water Quality Goals

The proposed layover facility will meet all applicable state and federal water quality standards and will comply fully with this standard.

Reduction of Flood and Erosion-Related Hazards on Lands Subject to the 100-Year Storm Event or Sea Level Rise

The proposed layover facility will be located approximately 20 feet above the Taunton River, well above the 100-year storm event. The site is not subject to inundation during predicted storm events or sea level rise and is not damage prone or a natural buffer area.

Protection or Enhancement of Public Views and Visual Quality in the Natural And Built Environment of the Shoreline

The primary public views of the Taunton River shoreline potentially affected by the proposed layover facility are from the North Main Street corridor east of the site and the adjacent private residences and

side-streets. These public views, and the associated visual quality will not be substantively affected by the project because the North Main Street corridor is approximately 20 feet above the elevation of the proposed site. The ground elevation continues to rise east of North Main Street to approximately 80 feet above the site at Route 79.

The public views of the layover facility could be further mitigated by screening if deemed necessary during licensing. However, this would be of limited effect in light of the small potential changes in public views resulting from the project.

Preservation of Historic Sites and Districts, Archaeological Sites, and Other Significant Cultural Resources Near Waterways

The proposed layover facility site is filled land and does not contain any known site, district, archaeological site, or other culturally significant resource.

8.9.3.3 Municipal Harbor Plans

The municipal harbor planning process is voluntary, established by the regulations at 301 CMR 23.00. Municipalities may implement local planning goals for their waterfronts. An approved MHP is intended to guide state agency actions related to waterfront development, permitting, and planning, and provides a formal mechanism for local input to the Chapter 91 licensing process. Approved MHPs may substitute numerical provisions regarding building height, setbacks, open space, and ground floor uses within Commonwealth tidelands.

The South Coast Rail project includes construction activities and changes in use within the geographic planning area for two MHPs:

- New Bedford/Fairhaven Municipal Harbor Plan, and
- Fall River Municipal Harbor and Downtown Economic Development Plan.[7]

The following sections describe the South Coast Rail project’s consistency with these MHPs.

New Bedford/Fairhaven Municipal Harbor Plan

The New Bedford/Fairhaven MHP was prepared through a collaborative effort by the Cities of New Bedford and Fairhaven, OCZM, MassDEP, and the Seaport Advisory Council. The New Bedford/Fairhaven MHP was approved by the Secretary of Energy and Environmental Affairs on June 14, 2012.

This planning area includes the proposed sites for the Wamsutta Layover Facility and the Whale’s Tooth Station. However, these facilities are not subject to licensing under Chapter 91 as they would be located on landlocked filled tidelands; they are not required to be consistent with the approved MHP to comply with the provisions of 310 CMR 9.34.

Pursuant to 301 CMR 23.05(3), MassDOT has been an active participant in the development of the New Bedford/Fairhaven MHP as it relates to the South Coast Rail project. The MHP recognizes the importance of restoring rail service as a critical component of transportation and industrial infrastructure in the port of New Bedford.

[7] The Fall River Harbor and Downtown Economic Development Plan is not an approved plan under 301 CMR 23.00 or 310 CMR 9.00.

The New Bedford/Fairhaven MHP identifies the combined Whale's Tooth Station as a suitable location to support commuter rail, local and regional bus service, taxis, and waterfront trolley service, and potentially accommodate future rail and pedestrian links to a water terminal.

Fall River Harbor and Downtown Economic Development Plan

In October 2002, the City of Fall River completed an Economic Development Plan in consultation with a diverse group of regional stakeholders including the OCZM and MassDEP. The plan was prepared with the goal of obtaining approval by the Massachusetts Secretary of Energy and Environmental Affairs under the provisions of Municipal Harbor Plan Approval regulations (301 CMR 23.00). While the Economic Development Plan was submitted to the Secretary for approval, it was not approved, pending further revisions. Therefore, the Economic Development Plan does not meet the regulatory criteria for approved harbor plans and does not serve as formal regulatory guidance for the licensing process.

None of the bridges or culverts subject to Chapter 91 licensing (as listed in Table 8.9-1) are located within Fall River. Nonetheless, the South Coast Rail project has been planned and conceptually designed in a manner consistent with the Fall River Harbor and Downtown Economic Development Plan in terms of supporting water dependent uses and improving public access to the Fall River waterfront while avoiding non-water dependent uses in the DPA or filled tidelands subject to licensing.

8.10 MASSACHUSETTS ENDANGERED SPECIES ACT

This section describes the regulatory context, regulatory requirements, and how the South Coast Rail project would comply with requirements of the MESA protecting state-listed rare species.

8.10.1 Regulatory Context

MESA protects rare plants and animals and their designated critical habitats; the Massachusetts Wetlands Protection Act protects wildlife habitat. NHESP has determined that the Stoughton Alternative would result in a "take" of state-listed rare species and would require a Conservation and Management Permit (CMP). There would be no impacts to federally listed endangered species.

8.10.2 Regulatory Requirements

MESA prohibits "taking" any state-listed rare plants and animals unless specifically permitted for scientific, educational, or propagation purposes, or where a CMP is issued. "Take" includes protection of rare species habitat, and is defined as "*in reference to animals to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat.*"

The regulations implementing MESA (321 CMR 10.05) state that "[a]ll State Agencies shall review, evaluate, and determine the impact on Endangered, Threatened and Special Concern species or their habitats… and use all practicable means and measures to avoid or minimize damage to such species or their habitats." State agencies are responsible for demonstrating to the Secretary that all practicable means and measures to protect rare species and their habitats have been incorporated into the project

design. A project that would result in a “take” requires a CMP from the NHESP. Additional regulatory requirements of MESA are:

- 321 CMR 10.23(2)(a) requires that an applicant adequately assess alternatives to both temporary and permanent impacts to State-listed species.
- 321 CMR 10.23(2)(b) requires that a CMP may only be issued where “an insignificant portion of the local population would be impacted by the Project or Activity”.
- 321 CMR 10.23(2)(c) requires that a CMP may only be issued where “the applicant agrees to carry out a conservation and management plan that provides a long-term Net Benefit to the conservation of the State-listed species”.
- 321 CMR 10.23(7) establishes certain performance standards including mitigation ratios to achieve the long-term Net Benefit performance standard. These ratios are based on the amount of habitat impacted and the category of State-listed species:
  - Endangered species require a mitigation ratio of 3:1 (three times the amount of affected habitat).
  - Threatened species require a mitigation ratio of 2:1.
  - Special Concern species require a mitigation ratio of 1.5:1.

The Director may approve an alternative mitigation approach that differs from these ratios where the alternative approach is appropriate, considering factors that include but are not limited to:

- The size and configuration of the habitat impact;
- The threats to the affected State-listed species posed by uses or activities located adjacent to or in close proximity to the project;
- The size, configuration and quality of the habitat proposed to be protected;
- The population density of the affected State-listed species; and
- The habitat management and research needs associated with the affected species.

8.10.3 Regulatory Compliance

NHESP has determined that the Stoughton Alternative would result in a “take” of three state-listed rare species: Blanding’s turtle, eastern box turtle, and blue-spotted salamander. The amount of habitat impacted would be determined during the permitting process, based on actual field delineation of rare species habitat, and would include a detailed analysis of actual habitat boundaries. Coordination with NHESP would continue through the selection of a final design and development of a detailed mitigation plan, as described in Chapter 7 of this FEIS/FEIR.

As documented in Chapter 3, MassDOT has evaluated four route alternatives (Attleboro, Stoughton, Whittenton, and Rapid Bus) and determined that none of these alternatives would avoid impacts to rare

species habitat. The USACE has determined that the Stoughton Electric Alternative is the LEDPA, as all of the other alternatives would not meet the project purpose, not be practicable or not be less environmentally damaging than the Stoughton Electric Alternative or a combination of the above. The As demonstrated in Chapter 4.15, *Threatened and Endangered Speices*, the impacts to habitat of each of the state-listed species affected by the Stoughton Alternative would be a negligible portion of the total available habitat.

The Stoughton Electric Alternative is not anticipated to affect the long term persistence of these species' populations. MassDOT has developed a draft Conservation and Management Plan, which has been provided to NHESP for review and comment. MassDOT would implement the final, approved Plan to provide a long-term benefit to impacted species. Elements of the Plan include:

- On and/or off-site permanent habitat protection;
- On and/or off-site habitat restoration and management;
- Measures to protect listed species during construction and to mitigate for barrier effects of the reconstructed track system;
- Research to enhance conservation efforts and rare species recovery; and
- Contribution toward development or implementation of an off-site conservation and protection plan for the impacted species.

Species-specific mitigation ratios and measures for direct impacts that achieve the net-benefit standard are:

- For Blanding's turtle (State Threatened), a 2:1 mitigation ratio is required. To provide a net benefit, MassDOT has agreed to provide funding to protect 25 acres of land potentially used by the Hockomock Swamp population of Blanding's turtle, as well as to fund a study of this population that would determine the size and status of the population, identify nesting areas, identify important non-breeding areas, and identify locations where migratory pathways cross Route 138.
- For eastern box turtle (State Special Concern), a 1.5:1 mitigation ratio is required. To provide a net benefit, MassDOT has agreed to provide funding to the eastern box turtle mitigation bank equivalent to protecting 17 acres, or to protect 17 acres of habitat available to this population.
- For the blue-spotted salamander (State Special Concern), a 1.5:1 mitigation ratio is required. To provide a net benefit, MassDOT has agreed to provide funding to protect approximately 11 acres of land potentially used by the Hockomock Swamp population of blue-spotted salamander.
- MassDOT anticipates that the land protection for the Blanding's turtle and blue-spotted salamander may overlap, and may be combined with wetlands preservation required for wetland mitigation.

NHESP has determined that minor impacts to the habitat of invertebrate species, and other species present along the active New Bedford Main Line and Fall River Secondary (the Southern Triangle), would not constitute a "take" based on the conceptual design.

Implementation of the CMP will ensure that the affected species will realize a net benefit from the South Coast Rail project.

8.11 WILD AND SCENIC RIVERS ACT

Section 7(a) of the Wild and Scenic River Act (16 U.S.C. 1278 *et seq.*) provides that no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the secretary charged with its administration (33 CFR 320.3(l)).

As discussed in Chapter 4.5, *Visual Resources*, the South Coast Rail project is subject to the Wild and Scenic Rivers Act since portions of the Taunton River were designated as "scenic" or "recreational" river areas under the Act in March 2009. Specifically, the segment along the Fall River Secondary and the segment through Taunton from Weir Street to Route 24 were designated as a "recreational river area," which is defined by the Act as a segment with a partially developed shoreline and ready access.

Consultation with the NPS would be necessary to obtain concurrence that the effects of the South Coast Rail project on the recreational values of the Taunton River would be neither invaded nor unreasonably diminished. The applicability of this consultation requirement for the Stoughton Alternative is summarized below.

The Stoughton Electric Alternative includes the New Bedford Main Line, which crosses the Taunton River just south of Weir Junction. The Stoughton Line also crosses the Taunton River at three locations north of Weir Junction, as well as a tributary to the Taunton River (the Mill River) within 0.25 mile of the Taunton River's main stem. Bridge replacement at all of these locations would affect the visual environment of the Taunton River as regulated by the NPS under the Wild and Scenic Rivers Act. The layover facility site along the Fall River Secondary (Weaver's Cove East) also would affect the visual environment of the Taunton River. The NPS was contacted for consultation. A meeting between MassDOT and representatives from the NPS Wild and Scenic Rivers Program was held in January 2012 to discuss the proposed project. Detailed descriptions of the South Coast Rail project's potential impacts to the Taunton River from the proposed bridge replacement and Fall River Depot Station were provided to the NPS and are described in Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*. Further consultation with NPS is anticipated as the project advances through the design process.

Determining if a project would result in a direct and adverse effect to a designated river requires consideration of aspects of the project potentially impacting the river, and the scope of the evaluation should be consistent with the magnitude and complexity of the project. The evaluation of the potential impact to the Wild and Scenic River designation that may result from the proposed replacement of the Taunton River bridges under the Stoughton Electric Alternative, as required by Section 7[8], is presented below.

[8] Interagency Wild and Scenic Rivers Coordinating Council. 2004. Appendix C: Evaluation Procedure Under "Direct and Adverse."

1. Define the proposed activity.

   The project proponent, MassDOT, proposes to replace four bridges over the Taunton River because the existing bridges are in deteriorating condition and do not meet the safety and performance requirements for the South Coast Rail project. The four bridges are located in Taunton, Massachusetts, as shown on Figure 4.10-23. The bridge replacement project would require 4 years to complete and the bridges would be in operation indefinitely thereafter. The existing multi-span bridges, piers, and abutments would be removed; new abutments and superstructure would be installed. The replacement bridges would be one- or two-span structures. The riverbank would be graded to allow for wildlife passage.

2. Describe how the proposed activity will directly alter within-channel conditions.

   The replacement activities would be conducted at the locations of the existing four bridges, largely within the footprint of the existing bridges. The new abutment locations, behind the existing abutment sites, would slightly extend the bridge length. There would be no changes to the active channel location, channel geometry, channel shape, channel form, or water quality parameters. Navigability of the river would be improved by replacing multi-span structures by one- or two-span structures. There would be no adverse impacts to outstanding resources values of the river channel.

3. Describe how the proposed activity will directly alter riparian and/or floodplain conditions.

   New abutments would be constructed behind the existing abutments, expanding the riparian area and floodplain slightly. The riverbank at these locations would be re-graded consistent with the slope of the bank up- and downstream from the bridge location. The floodplain would be slightly expanded as a result of replacing the abutments. There would be no adverse impacts to outstanding resources values of the riparian area.

   Describe how the proposed activity will directly alter upland conditions.

   The project would not alter upland conditions. The work would be conducted within the existing railroad footprint, using rail-mounted equipment.

5. Evaluate and describe how changes in on-site conditions can/will alter existing hydrologic or biologic processes.

   The project would not adversely alter existing hydrologic or biologic processes. All aspects of the bridge replacement would improve river flow characteristics by replacing the existing multi-span structures with one- or two-span bridges and moving the abutment locations up-bank. Potential impacts to water quality during construction would be managed in accordance with regulatory requirements of the National Pollutant Discharge Elimination System program, specifically described in a project-specific Stormwater Pollution Prevention Plan.

6. Estimate the magnitude and spatial extent of potential off-site changes.

   There would be no off-site changes from the bridge replacement activities that would impact the river.

7. Define the time scale over which steps 3 through 6 are likely to occur.

The bridge construction activities are expected to require 4 years to complete. The bridges would be used indefinitely thereafter.

8. Compare project analyses to management goals.

   The bridge replacements are not expected to adversely affect the achievement or timing of achievement of the management goals and objectives for the Taunton River, as described in the *Taunton River Stewardship Plan*.[9]

9. Make the Section 7 determination.

   The bridge replacements would improve riparian area and floodplain conditions, and would not affect water quality, outstanding resources values, or the recreational river classification. Replacing and using four bridges over the Taunton River is not expected to result in a direct and adverse effect to the recreational nature of the Taunton River in this reach.

8.12 NATIONAL HISTORIC PRESERVATION ACT AND MASSACHUSETTS GENERAL LAW CHAPTER 9

As discussed in detail in Chapter 4.8, cultural resources are regulated at the federal and state levels and are always considered in NEPA and MEPA analyses. At the federal level, Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800) provides the regulatory framework for the compliance guidelines for the identification and evaluation of cultural resources. At the state level, Massachusetts General Laws Chapter 9, Chapter 254, Sections 26-27C, as amended; and 950 CMR 71.00, 950 CMR 70.00 provides the regulatory framework for the state compliance guidelines, under the jurisdiction of the Massachusetts Historical Commission (MHC). Other relevant legislation and regulations include the National Environmental Policy Act of 1969, as amended;[10] Executive Order 11593, “Protection and Enhancement of Cultural Environment;”[11] Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended,[12] implementing regulation 36 CFR 800, as revised January 2001; and, the Procedures for the Protection of Historic Properties (Appendix C) at 33 CFR Part 325 - Processing of Department of the Army Permits.

The historic and archaeological resources intensive surveys for the South Coast Rail project were undertaken in accordance with the Secretary of the Interior’s *Standards and Guidelines for Identification* (48 FR 44720-23), the Massachusetts Historical Commission (MHC) standards and guidelines set forth in *Public Planning and Environmental Review: Archaeology and Historic Preservation* (MHC 1985), and the MHC historic resources survey standards. The survey complies with the standards of the MHC, state archaeologist’s permit regulations (950 CMR 70), the Secretary of the Interior’s *Standards and Guidelines for Identification* (48 FR 44720-23), The Standards of the Massachusetts State Register of Historic Places (State Register), and NPS guidelines for assessing eligibility for listing in the National Register, specifically *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. While the surveys conducted to date have informed the impact analysis, additional surveys

[9] Taunton River Stewardship Council. 2005. *Taunton River Stewardship Plan, Taunton River Wild & Scenic River Study.* Prepared by the Taunton Wild and Scenic River Study Committee, Southeastern Regional Planning & Economic Development District, and National Park Service-Northeast Region.

[10] National Environmental Policy Act of 1969, as amended (42 .S.C. $$ 4321-4347).

[11] Executive Order No. 11593. “Protection and Enhancement of the Cultural Environment,” CFR 154 (1971) reprinted in 16 U.S.C.$470 note.

[12] Advisory Council on Historic Preservation. Sections 106 and 110 of the National Historic Preservation Act of 1966 (January 2001) 36 CFR 800.

will be conducted as necessary when more design information is available to further and more specifically assess potential impacts to cultural resources.

8.12.1 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA) seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among agency officials and other parties with an interest in the effects of the undertaking on historic properties. The goal of the consultation is to identify historic properties with the potential to be impacted by the undertaking, assess its effects, and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties.[13]

As the lead federal agency for the South Coast Rail project, the Corps has compliance responsibilities regarding cultural resources under the Procedures for the Protection of Historic Properties (Appendix C) at 33 CFR Part 325 - Processing of Department of the Army Permits, Section 106 of the NHPA as amended, the regulations of the Advisory Council on Historic Preservation (Council) at 36 CFR 800, and NEPA.

8.12.2 Massachusetts General Law Chapter 9

MassDOT serves as the lead state agency and is responsible for identifying and evaluating properties through archaeological and historic architectural surveys in accordance with MGL Ch. 9 Sections 26-27C, as amended; 950 CMR 71.00, 950 CMR 70.00 and MEPA. MGL Chapter 9 Section 26 27C stipulates that any project that requires funding, licenses or permits from any state agency must be reviewed by the MHC.

8.13 GENERAL CONFORMITY WITH CLEAN AIR ACT AND NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

As discussed in Chapter 4.9, *Air Quality*, the South Coast Rail project is subject to General Conformity (Title 40 CFR Part 93, Subpart B). General conformity provisions only apply in nonattainment and maintenance areas. Given that the project area is nonattainment for the 8 -hour ozone standard, the relevant pollutants for consideration are the two ozone precursors: volatile organic compounds (VOC) and nitrogen oxides (NO_x). The long-term effect of the Stoughton Alternative on VOC and NO_x emissions is beneficial (e.g. reduced emissions relative to the No-Build alternative). Therefore, a conformity determination would not be required to address long-term operational emissions, even if such emissions could be practically controlled by USACE. As discussed in Section 4.9.1.2, long-term operation emissions (such as from diesel locomotives under the diesel rail alternatives), are not indirect emissions within the scope of General Conformity because USACE cannot control them and has no continuing program control over the rail line.

However, General Conformity also applies to peak year construction emissions. The construction-related emissions of this project are a reasonably foreseeable consequence of the USACE Section 404 permit decision. If construction emissions exceed certain *de minimis* criteria, a General Conformity determination could be required. The *de minimis* criteria for this project (ozone nonattainment area in an ozone transport region) are 50 tons/year for VOC and 100 tons/year for NO_x.

[13] Advisory Council on Historic Preservation. Section 106 of the National Historic Preservation Act of 1966 (June 17, 1999) 36 CFR 800.1(a).

The construction schedule and staging of the Stoughton Electric Alternative has not been defined in sufficient detail at this point in the development of the project to quantify construction period VOC and NO_x emissions for comparison to the *de minimis* criteria. The Corps will require the preparation of a General Conformity applicability analysis for peak construction year emissions of the preferred alternative prior to the NEPA Record of Decision. If the *de minimis* criteria are not exceeded, no further review will be required. If the criteria are exceeded, a General Conformity determination (including 30-day public review period) will be required prior to project implementation.

8.14 ARTICLE 97 OF THE COMMONWEALTH OF MASSACHUSETTS

The Secretary of the Executive Office of EEA has defined lands subject to Article 97 as "land or interests in … land owned or held by the Commonwealth or its political subdivisions"[14] that protect these interests. It is assumed that the publicly owned open spaces below that have been identified are Article 97 lands subject to the EEA Article 97 Land Disposition Policy.

The goal of the EEA Policy is to ensure no net loss of Article 97 lands. As a general rule, the EEA and its agencies "shall not sell, transfer, lease, relinquish, release, alienate, or change the control or use of any right or interest of the Commonwealth in and to Article 97 land." Exceptions to this goal are included in the EEA Policy; disposition of Article 97 land is not supported unless exceptional circumstances exist. All other options to avoid use of Article 97 land must be explored and no feasible and substantially equivalent alternatives exist.

The policy requires that EEA agencies minimize land disposition occurrences. All Article 97 land disposition proposals are to be coordinated with the EEA, and any Article 97 land disposition that is recommended must be justified and explained to the Secretary of the EEA. Any Article 97 land disposition must be authorized by enacted legislation and approved by all municipal, state, and federal agencies, authorities, or other governmental bodies as required and empowered.

According to the EEA Policy, Article 97 land disposition cannot be supported unless EEA and its agencies determine that exceptional circumstances exist. A determination of "exceptional circumstances" is subject to all of the following conditions being met:

- All other options to avoid the Article 97 disposition have been explored and no feasible and substantially equivalent alternatives exist;
- The disposition of the subject parcel and its proposed use do not destroy or threaten a unique or significant resource;
- As part of the disposition, real estate of equal or greater fair market value or value in use of proposed use, whichever is greater, and significantly greater resource value are granted to the disposing agency or its designee;
- The minimum acreage necessary for the proposed use is proposed for disposition and, to the maximum extent possible, the resources of the parcel proposed for disposition continue to be protected;

[14] EEA. *1998. Article 97 Land Disposition Policy.* Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Massachusetts Environmental Policy Act Office: Boston.

- The disposition serves an Article 97 purpose or another public purpose without detracting from the mission, plans, policies and mandates of EEA and its appropriate department or division; and

- The disposition of a parcel is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests therein to the Commonwealth.

To the extent possible based upon readily available information and conceptual engineering plans, an evaluation of the project with respect to these six criteria is provided in Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*. The Stoughton Electric Alternative would require approximately 0.16 acre of Article 97 land acquisition. As described in Section 4.10.4.2, compliance with the Article 97 land disposition exceptional circumstances criteria would be completed for the selected alternative once the engineering design is finalized and replacement sites identified.

8.15 AREAS OF CRITICAL ENVIRONMENTAL CONCERN (ACEC) PROGRAM

As discussed in Chapter 4.10, *Protected Open Space and Areas of Critical Environmental Concern*, ACECs are "those areas within the Commonwealth where unique clusters of natural and human resource values exist and which are worthy of a high level of concern and protection."[15] ACECs are designated by the EEA, and the ACEC program is administrated by the Massachusetts Department of Conservation and Recreation.

Commonwealth regulations[16] indicate that all EEA agencies must take action, administer programs, and revise regulations in order to acquire useful scientific data on the ACEC; preserve, restore, or enhance the resources of the ACEC; and ensure that activities in or impacting on the ACEC are carried out so as to minimize adverse effects on seven environmental resources, as addressed in other chapters of this FEIS/FEIR:

- Marine and Aquatic Productivity: Chapter 4.18, *Chapter 91 Compliance and Coastal Zone Consistency*; Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*; Chapter 4.15, *Threatened and Endangered Species*; Chapter 4.16, *Wetlands*; Chapter 4.17, *Water Resources*.

- Surface and Groundwater Quality: Chapter 4.17, *Water Resources*.

- Habitat Values: Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*; Chapter 4.15, *Threatened and Endangered Species*.

- Storm Damage Prevention or Flood Control: Chapter 4.16, *Wetlands*.

- Historic and Archaeological Resources: Chapter 4.8, *Cultural Resources*.

- Scenic and Recreational Resources: Chapter 4.5, *Visual and Aesthetic Resources*.

- Other Natural Resource Values of the Area: Chapter 4.16, *Wetlands* and Chapter 4.11, *Farmland Soils*.

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[15] EEA. 2009. 301 CMR 12.03 Areas of Critical Environmental Concern, General Provisions. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs: Boston.

[16] EEA. 2009. 301 CMR 12.12: Effects of Designation. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs: Boston.

The Stoughton Electric Alternative would require the acquisition of one publicly owned parcel within the Hockomock Swamp ACEC in Easton: 0.50 acre of the Southeastern Regional Vocational Tech School land. This land would be used for a traction power substation. The area represents a small proportion of the ACEC and acquisition would not substantively affect any of the resource areas of concern.

8.16 FARMLAND PROTECTION POLICY ACT

The FPPA, P.L. 9798,[17] authorizes the USDA to develop criteria to identify the effects of federal programs on the conversion of farmland to non-agricultural uses. If it is determined that farmland conversion may involve land protected under the FPPA, formal coordination is required per 7 CFR Part 658. The NRCS reviews potential impacts to farmland to determine if the land qualifies as prime or unique farmland or farmland of statewide importance. Forms AD-1006 and CPA-106, which outline direct and indirect impacts to farmland and assign an impact rating at each location, would be submitted by the project for review and scoring by the NRCS. Impacts with scores less than 160 are considered insignificant, between 161 and 200 potentially adverse, and scores over 200 are considered potentially significant. Scores over 160 may require the project to further assess the implications of the proposed action on the farmland and potentially consider alternatives to further minimize or avoid farmland losses. During the environmental review process, agencies having jurisdiction or special use expertise may provide a letter which may include recommended measures to mitigate project effects.

As discussed in Chapter 4.11, *Farmland Soils*, the NRCS has not been requested to complete a Farmland Conversion Impact Rating for any of the South Coast Rail project alternatives at this time because the impacts are not expected to be significant. Drafts of the NRCS Farmland Conversion Impact Rating Forms AD-1006 and CPA-106 have been prepared for sites larger than 2 acres where designed farmland soils may be impacted. These forms are included in Appendix 4.11-A. Subject to comments from agencies with jurisdiction or special use expertise concerning important farmland, mitigation measures may be developed as appropriate.

None of the sites that impact farmland soils resulted in a score greater than 160 on the draft Form AD-1006 or CPA-106. These findings indicate that the Stoughton Electric Alternative would not have a detrimental impact on agricultural lands nor would it convert land from active agricultural use to nonagricultural use.

8.17 MASSACHUSETTS EXECUTIVE ORDER 193

EO 193 directs state agencies to avoid conversion of agricultural lands to non-agricultural uses. Three criteria are evaluated to determine if a parcel is considered agricultural land for purposes of EO 193:

- the presence of soil types capable of supporting or contributing to present or potential commercial agriculture
- current and historic use for agriculture, and
- absence of non-farm development

Impacts to mapped areas of farmland soils were evaluated where conversion of previously undeveloped land is proposed as part of the South Coast Rail project. Although several sites are located within

[17] United States Department of Agriculture, Farmland Protection Policy Act, 1981, (Public Law 97-98, 7 U.S.C. 4201).

mapped areas of farmland soils, none are currently in agricultural production. All non-corridor sites are adjacent to existing rail corridors and public roadways and are located in areas that are at least partially developed and are therefore less suitable for conversion to agricultural usage.

The Stoughton Electric Alternative would not convert land from active agricultural use to nonagricultural use.

8.18 MASSACHUSETTS CONTINGENCY PLAN (310 CMR 40.0000)

As discussed in Chapter 4.12, *Hazardous Materials*, the spill or release of Oil or Hazardous Materials (OHM) in the process of constructing the South Coast Rail project is an unlikely event, and measures would be required to prevent and control any such spills. The construction contractors would implement a Spill Control Program in compliance with the Massachusetts Contingency Plan (310 CMR 40.0000, “the MCP”) and MBTA policy. These measures would be employed both at the rail reconstruction sites and station construction sites.

Properties with confirmed OHM impacts are generally managed in accordance with the MCP, 310 CMR 40.0000 and associated policies or guidance issued by the DEP. However, depending on the type and concentrations of OHM present at a property, other regulations implemented by the Commonwealth of Massachusetts or the USEPA may apply.

The Stoughton Electric Alternative would require acquisition of properties with RECs that would require further investigation. In each case, remediation or soil/groundwater management during construction could be required.

For contaminated property owned by MassDOT, response actions would be required pursuant to the milestones outlined in the MCP. Notification to the DEP would be required if a reporting condition is identified as per the MCP or if OHM is detected in soil and/or groundwater above the applicable standards, referred to as the Reportable Concentrations. A Licensed Site Professional (LSP) would then most likely need to be retained to verify that notification is required, to further assess and manage the site, direct response actions, and specify procedures for work performed in the contaminated areas, such as soil excavation, in accordance with the MCP and, if need be, to render appropriate Opinions. The LSP would also determine if risk reduction measures are required.

To extend MCP deadlines for response action and report submittals so that the response actions can be coordinated with the construction of the stations, layovers, and expansion of the rail lines, the application for a Special Designation Permit (as per 310 CMR 40.0060 of the MCP) may be warranted.

At many sites containing impacted soil, it is often not possible to reach a regulatory endpoint by using soil excavation and off-site disposal as the only type of remediation. It is advisable to explore other options such as the re-use of soil in order to minimize the quantity of soil to be excavated and disposed off-site. For low levels of impacted soil where a risk assessment shows an unacceptable risk for current and future unrestricted use, a deed restriction consisting of an Activity and Use Limitation (AUL) may be implemented after construction is completed to meet a regulatory endpoint. As per 310 CMR 40.1012(3)(c) of the MCP, AULs are not required within railroad rights-of-way.

Soil impacted with OHM above the Reportable Concentrations that is encountered during the implementation of the South Coast Rail project would be managed appropriately in accordance with the MBTA Design Construction Standard Specifications, Section 02282, entitled “Handling, Transportation

and Disposal of Excavated Material." Preliminary assessment activities may assist in identifying the type and quantity of OHM impacted media which would require management under these protocols and help select the optimal disposal methods and/or destination prior to generation. A summary of the MBTA Specification is provided in the following sections of Chapter 4.12, *Hazardous Materials*:

- 4.12.4.1 Management of Impacted Soil
- 4.12.4.2 Management of Impacted Groundwater;
- 4.12.4.3 Management of Hazardous Demolition Debris and Used Railroad Ties
- 4.12.4.4 Health and Safety Requirements
- 4.12.4.5 Closure Reports

9 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

9.1 INTRODUCTION

This chapter provides a summary of public involvement and agency coordination activities conducted by the Corps and/or MassDOT in the development of the FEIS/FEIR.

9.2 PUBLIC INVOLVEMENT

The Corps published a NOI to prepare an Environmental Impact Statement on the South Coast Rail Project Section 404 permit application in the Federal Register on October 31, 2008.[1] For the MEPA process, the South Coast Rail ENF was noticed in the Environmental Monitor on November 24, 2008. Comments on the NOI and ENF were accepted until January 9, 2009. On February 20, 2009, additional information on ridership studies was provided for public review and the deadline for comments on the ENF was extended until March 17, 2009.

The Corps and the MEPA Office of the Massachusetts Executive Office of EEA held joint Corps/MEPA-sponsored public scoping meetings on December 2 and 3, 2008.[2] The scoping meetings provided an opportunity for the public, interested groups and local, state and federal agencies to comment on potential issues or concerns associated with the proposed project. The outcome of the scoping meetings and the public comment period following those meetings was used to help shape the issues studied in the DEIS/DEIR.

ENF comments were received from federally- and state-elected officials; USEPA; the National Park Service; eight state agencies; four regional agencies; ten municipalities; 13 non-governmental organizations; and 45 individuals and businesses. Pursuant to existing MEPA requirements,[3] MassDOT prepared a Response to Comments on the ENF, which was included as an appendix to the DEIS/DEIR. While the responses to the ENF comments were prepared solely by MassDOT, the Corps considered all comments received as part of the preparation of the DEIS/DEIR and this FEIS/FEIR.

In addition to the public scoping meetings by the Corps/MEPA office, MassDOT has conducted its own public meetings and workshops throughout the study process. MassDOT notified interested parties, elected officials, and residents of upcoming meetings and new information through fact sheets, newspaper announcements, flyers and posters, cable-televised meetings, and/or e-mail notifications. Additional information on MassDOT's public outreach is provided on the project website (http://www.mass.gov/southcoastrail).

In March 2011, the Corps released the DEIS/DEIR for the South Coast Rail project[4] for public review and comment. The Corps published a public notice announcing the availability of the joint DEIS/DEIR on March 23, 2011, as well as a notice in the Federal Register on March 25, 2011. The notices provided information about the DEIS/DEIR availability, including the website where an electronic version of the

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[1] Federal Register 73:212, 64927-64928 (October 31, 2008)

[2] Scoping meetings were held December 2, 2008 at 6:30 p.m. at the University of Massachusetts-Dartmouth, Woodland Commons Building, 285 Old Westport Road, North Dartmouth and on December 3, 2008 at 6:30 p.m. in the Taunton High School Auditorium, 50 Williams Street in Taunton.

[3] 301 CMR 11.07

[4] U.S. Army Corps of Engineers, New England District. 2011. *Draft Environmental Impact Statement/Draft Environmental Impact Report: South Coast Rail Project, Bristol, Plymouth, Norfolk and Suffolk Counties, Commonwealth of Massachusetts.* U.S. Army Corps of Engineers New England District, Concord, MA.

DEIS/DEIS is posted;[5] a listing of the 24 public libraries where copies of the DEIS/DEIR were made available for public review; the comment period and deadline; and public hearing dates and locations. The DEIS/DEIR was publicized in the MEPA Environmental Monitor on March 23, 2011. After detailed review, on June 29, 2011 the Secretary issued a Certificate on the 2011 DEIR.

Two public hearings were held to receive comments on the DEIS/DEIR. On the evening of May 4, 2011, a public hearing was held at Qualters Middle School, 240 East Street in Mansfield. On the evening of May 5, 2011, a second hearing was held at the Keith Middle School, 225 Hathaway Boulevard in New Bedford. Public hearing transcripts are included in Volume III of the FEIS/FEIR. Written comments on the DEIS/DEIR were accepted until the close of the public comment period on May 27, 2011, and are available on the MassDOT project website.[6] Responses to DEIS/DEIR comments are provided in Volume III of this FEIS/FEIR.

MassDOT will host two open houses to provide information on the FEIS/FEIR. Subject area experts will be available to talk directly with participants and answer questions. The open houses will be scheduled in the Taunton area and in the Fall River/New Bedford area. The meetings will be scheduled during the comment period on the FEIS/FEIR, probably in early October. The dates will be posted on the project website, shared in an email blast to everyone on the database, and announced in regional and local publications on the South Coast. Comment sheets will be available at the open houses, should a participant want to comment on site, and there will be information on how to submit comments in writing during the comment period. MassDOT will ask local cable television stations to provide coverage of the open houses and/or Task Force meeting.

MassDOT will also present the FEIS/FEIR at a meeting of the Commuter Rail Task Force on October 16 (this meeting will take place on the south coast; the location has not been determined). The project team will also present information on the document by request, to elected officials and organizations in the region.

Given the size of the document, MassDOT is producing a Guide to the FEIS/FEIR. The guide will summarize the principal conclusions of the document and highlight the material contained in each section so that the public can easily locate and review topics of interest. In addition, MassDOT will publish a Fact Sheet with similar information at a higher level, also advising the public on how to participate in the open houses, where to find the FEIS/FEIR or get a copy of the document, and how to comment on the FEIS/FEIR.

MassDOT will announce the availability of the FEIS/FEIR as widely as possible, release a statement to the media; post information on the project website; send an email announcement to the database; and share information through the Commuter Rail Task Force, elected and municipal officials.

In accordance with the CEQ NEPA regulations, the Corps can issue a Record of Decision no sooner than thirty days after publication in the Federal Register of the notice of availability of the FEIS/FEIR (40 CFR § 1506.10).

9.3 AGENCY COORDINATION

Cooperating agencies are federal agencies that have legal jurisdiction or special expertise in the issues being addressed in an EIS and assist the lead agency in the NEPA process (40 CFR 1501.6). Four federal

[5] http://www.nae.usace.army.mil/Missions/ProjectsTopics/SouthCoastRail.aspx.
[6] http://www.southcoastrail.com/env_Review.html.

agencies accepted the Corps' request to serve as cooperating agencies for the preparation of the South Coast Rail EIS: the USEPA, the FHWA, the FTA, and the FRA. Copies of the cooperating agency status acceptance letters from the above listed agencies are provided in Appendix 9.3-A.

MassDOT convened an Interagency Coordinating Group of federal and state regulatory agencies to inform the environmental review process. In addition to the South Coast Rail Project Manager for the Corps, representatives of the following entities were invited to participate in the Interagency Coordinating Group:

- United States Environmental Protection Agency
- United States Fish and Wildlife Service
- Federal Highway Administration
- Federal Transit Administration
- National Marine Fisheries Service
- Narragansett Indian Tribe
- Wampanoag Tribe of Gay Head (Aquinnah)
- Massachusetts Executive Office of Energy and Environmental Affairs
- Massachusetts Environmental Policy Act Office
- Massachusetts Bay Transportation Authority
- Massachusetts Department of Environmental Protection
- Massachusetts Office of Coastal Zone Management
- Massachusetts Department of Conservation and Recreation, Areas of Critical Environmental Concern Program
- Massachusetts Department of Fish and Game, Natural Heritage and Endangered Species Program
- Massachusetts Historical Commission
- Southeastern Regional Planning and Economic Development District

This group began meeting in September 2007 and met monthly through November 2009, and less frequently through July 2010. The group meets with the objective of informing the environmental review process for the project by discussing key items, including project purpose and need, scope of alternatives for study, methodology for obtaining data, and analysis of data. Table 9-1 lists Interagency Coordinating Group meeting topics and dates.

In addition, as required by the Secretary's Certificate on the ENF, a working group was formed to develop a scope for the analysis of greenhouse gas emissions and the potential secondary effects of the proposed project with and without the implementation of the Corridor Plan. Participants in this working group included representatives of the USEPA, Corps, and DEP. Two subgroups were also formed. A wetland subgroup was created to review wetland impacts and potential mitigation sites, which met from May through September 2012. The second subgroup was formed to develop smart growth monitoring plans and metrics, and met in Spring 2012.

A full record of group-approved meeting minutes is posted on MassDOT's project website: www.mass.gov/southcoastrail.

Table 9-1 Interagency Coordinating Group Meetings to Date

Meeting Topic	Date
Project Kickoff and Introduction	September 25, 2007
Project Purpose and Need – Draft	October 23, 2007
Project Purpose and Need – Draft: Phase 1 Screening Criteria	November 27, 2007
Project Purpose and Need – Draft: Phase 1 Screening Criteria; Review of Civic Engagement Input	December 19, 2007
Project Purpose and Need – Final: Phase 1 Screening Criteria	January 3, 2008
Phase 1 Screening Criteria – Final: Range of Phase 1 Alternatives	January 10, 2008
Phase 1 Analysis – Step 1 Screening Criteria Results	February 14, 2008
Phase 1 Analysis – Concurrence on Step 1 Screening Criteria Results; Review Step 2 Results	February 21, 2008
Phase 1 Analysis – Step 2 Concurrence; Review Step 3 Results and Conclusion of Phase 1	February 28, 2008
Phase 1 Analysis – Concurrence on Step 3 Results	March 4, 2008
Phase 1 Analysis – Draft Report; Review of Civic Engagement Input; Step 4 (Circling Back) Analysis	March 21, 2008
Phase 1 Analysis – Concurrence on Advancing Alternatives	April 1, 2008
Smart Growth Corridor Plan	May 27, 2008
Ridership Modeling; Role of the Interagency Coordinating Group	June 19, 2008
Environmental Data Collection Protocols, Potential Station Locations and Rail Operational Analysis	July 17, 2008
Proposed Station Locations; Environmental Review; Data Collection Protocols and Modeling	September 16, 2008
Preliminary Assessment of Alternatives; Environmental Notification Form	October 24, 2008
Discussion on Content of Environmental Notification Form	December 15, 2008
ENF Comments from MEPA; Priority Mapping; Ridership Memo	January 22, 2009
Supplemental Ridership Memo	February 26, 2009
Subcommittee Meeting on Wetlands	April 16, 2009
Subcommittee Meeting on Greenhouse Gases	May 5, 2009
Subcommittee Meeting on Secondary and Cumulative Growth Impacts	May 7, 2009
CAPS model; Secondary Growth Methodology; Wetlands Mapping Methodology	June 18, 2009
CAPS model; Secondary Growth and GHG methodology	July 21, 2009
Rail and Bus operations; Corridor Plan	August 20, 2009
DEIS Process; Secondary Growth Impacts Methodology and Results: Alternatives Analysis	October 22, 2009
CAPS Results' Secondary Growth Impacts	November 12, 2009
Subcommittee meeting on wetland mitigation	February 1, 2010
Subcommittee meeting on wetland mitigation	May 22, 2010
Alternatives Analysis	July 21, 2010
DEIS Review	March 30, 2011
Alternatives Analysis	June 13, 2012

Meeting Topic	Date
Wetland Impacts and Mitigation	May 4, 2012
Wetland Impacts and Mitigation	July 9, 2012
Wetland Impacts and Mitigation	August 29, 2012
Wetland Impacts and Mitigation	September 10, 2012
Smart Growth Monitoring Plan	April 26, 2012
Smart Growth Monitoring Plan	June 27, 2012

10 DISTRIBUTION LIST

10.1 FEDERAL AGENCIES

Advisory Council on Historic Preservation
Office of Federal Agency Programs
Attn: LaShavio Johnson/Anthony G. Lopez
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 803
Washington, DC 20004

Federal Highway Administration
United States Department of Transportation
Attn: NEPA Coordinator
Kendall Square
55 Broadway, 10th Floor
Cambridge, MA 02142

Federal Railroad Administration
United States Department of Transportation
Attn: NEPA Coordinator
1200 New Jersey Avenue SE
Washington, DC 20590

Federal Transit Administration Transportation Systems
Center Attn: NEPA Coordinator
Kendall Square
55 Broadway, Suite 920
Cambridge, MA 02142-1093

National Oceanic and Atmospheric Administration
Attn: John Bullard, Regional Administrator
55 Great Republic Drive
Gloucester, MA 01930-2276

National Park Service
Attn: Environmental Compliance Program
Boston Support Office
15 State Street
Boston, MA 02109

National Park Service
Attn: Environmental Compliance Program
Adams National Historical Park
135 Adams Street
Quincy, MA 02169

National Park Service
National Natural Landmarks Program
Attn: Deb DiQuinzio
15 State St.
Boston, MA 02109

National Park Service, Northeast Region
Dennis Reidenbach, Regional Director
National Park Service
U.S. Custom House
200 Chestnut Street, Fifth Floor
Philadelphia, PA 19106
(215) 597-7013,

United States Coast Guard
Attn: Gary Kassof
Commander, First Coast Guard District (dpb)
Battery Park Building
One South Street
New York, NY 10004-1466

United States Department of the Interior
Attn: Andrew Raddant, Regional Environmental Officer
408 Atlantic Avenue
Room 142
Boston, MA 02110

United States Environmental Protection Agency, New England
Attn: Timothy L. Timmermann
5 Post Office Square
Mail Code: ORA
Boston, MA 02109-3912

United States Environmental Protection Agency
Region OneAttn: H. Curtis Spalding, Regional Administrator
5 Post Office Square
Suite 100
Boston, MA 02109

United States Fish and Wildlife Service
New England Field Office
Attn: Maria Tur
70 Commercial Street, Suite 300
Concord, NH 03301

United States Fish and Wildlife Service
Northeast Regional Office
Attn: NEPA Coordinator
300 Westgate Center Drive
Hadley, MA 01035-9587

10.2 FEDERAL ELECTED OFFICIALS

Senator Elizabeth Warren
Massachusetts Office
2400 JFK Federal Building
15 New Sudbury Street
Boston, MA 02203

Senator Edward Markey
Boston Office
1 Bowdoin Square, 10th Floor
Boston, MA 02114

Representative Joseph Kennedy III, 4th District
8 North Main Street
Suite 200
Attleboro, MA 02703

Office of the 5th Massachusetts Congressional District
District Office in Massachusetts
5 High Street, Suite 101
Medford, MA 02155
Phone: (781) 396-2900

Congressman Stephen Lynch, 8th District
155 West Elm Street, Suite 200
Brockton, MA 02301

Congressman William R. Keating, 9th District
558 Pleasant St., Suite 309
New Bedford, MA 02740

10.3 STATE AGENCIES

Central Transportation Planning Staff
Attn: Scott Peterson
State Transportation Building
10 Park Plaza, Suite 2150
Boston, MA 02116

Massachusetts Office of Coastal Zone Management
Attn: Bruce Carlisle, Director
251 Causeway Street, Suite 800
Boston, MA 02114

Massachusetts Office of Coastal Zone Management
Attn: Project Review Coordinator
251 Causeway Street, Suite 800
Boston, MA 02114

DCR Division of Urban Parks
Attn: MEPA Coordinator
251 Causeway Street
Boston, MA 02114

DCR
Nancy Putnam, Director, Ecology and Areas of Critical Environmental Concern Program
251 Causeway Street
Boston, MA 02114

DCR
Attn: Jack Murray, Commissioner
251 Causeway Street
Boston, MA 02114

DCR Division of Water Supply Protection
Attn: MEPA Coordinator
251 Causeway Street
Boston, MA 02114

Department of Environmental Protection
Attn: Ken Kimmel, Commissioner
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Attn: Philip Weinberg
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Air Quality Control Program
Attn: Jerome Grafe
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Air Quality Control Program
Attn: Christine Kirby
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Bureau of Resource Protection
Attn: Lealdon Langley
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Bureau of Resource Protection
Attn: Mike Stroman, Wetlands Program Chief
One Winter Street
Boston, MA 02108

Department of Environmental Protection
Northeast Regional Office
Attn: Nancy Baker
205B Lowell Street
Wilmington, MA 01887

Department of Environmental Protection
Southeast Regional Office
Attn: Sharon Stone
20 Riverside Drive
Lakeville, MA 02347

Department of Environmental Protection
Southeast Regional Office
Attn: Elizabeth Kouloheras
20 Riverside Drive
Lakeville, MA 02347

Department of Environmental Protection
Southeast Regional Office
Attn: Chris Ross
20 Riverside Drive
Lakeville, MA 02347

Department of Environmental Protection, Water Pollution Control Program
Attn: MEPA
Coordinator
One Winter Street
Boston, MA 02108

Department of Environmental Protection, Wetlands and Waterways Control Program
Attn: Ben Lynch, Acting Chief
One Winter Street
Boston, MA 02108

Massachusetts Department of Fish and Game
Attn: Mary Griffin, Commissioner
251 Causeway Street, Suite 400
Boston, MA 02114

Massachusetts Division of Marine Fisheries
Attn: Paul Diodati, Director
251 Causeway Street, Suite 400
Boston, MA 02114

Division of Marine Fisheries
South Shore
Attn: Environmental Reviewer
838 South Rodney French Boulevard
New Bedford, MA 02744

Executive Office of Energy and Environmental Affairs
Attn: Richard K. Sullivan Jr., Secretary, Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Executive Office of Energy and Environmental Affairs, MEPA Office
Attn: Deirdre Buckley, Acting Director
100 Cambridge Street, Suite 900
Boston, MA 02114

Executive Office of Energy and Environmental Affairs, MEPA Office
Attn: Purvi Patel, MEPA Analyst
100 Cambridge Street, Suite 900
Boston, MA 02114

Executive Office of Energy and Environmental Affairs, Undersecretary for Policy
Attn: Chief Counsel
100 Cambridge Street, Suite 900
Boston, MA 02114

Massachusetts Bay Transit Authority
Attn: Dr. Beverly Scott, General Manager
10 Park Plaza, Room 3910
Boston, MA 02116

Massachusetts Bay Transit Authority
Attn: Andrew D. Brennan, Director of Environmental Affairs
10 Park Plaza, 6th Floor
Boston, MA 02116

Massachusetts Bay Transit Authority
Attn: Joseph Cosgrove, Project Manager
10 Park Plaza, Room 3920
Boston, MA 02116

Massachusetts Bay Transit Authority
Attn: Ronald K. Morgan, Project Manager for MBTA Planning & Development
10 Park Plaza, Room 3920
Boston, MA 02116

Massachusetts Department of Transportation
Attn: Secretary Richard Davey
10 Park Plaza, Suite 4160
Boston, MA 02116

Massachusetts Department of Transportation
Attn: Steve Woelfel
10 Park Plaza, Suite 4150
Boston, MA 02116

Massachusetts Department of Transportation
Attn: David Mohler
10 Park Plaza, Suite 4150
Boston, MA 02116

Massachusetts Bay Transit Authority Advisory Board
Attn: Paul Regan, Executive Director
177 Tremont Street, 4th Floor
Boston, MA 02111

Massachusetts Division of Fisheries and Wildlife
Attn: Wayne MacCallum, Director
100 Hartwell Street, Suite 230
West Boylston, MA 01583

Massachusetts Division of Fisheries and Wildlife
Natural Heritage & Endangered Species Program
Jonathan Regosin, Chief of Conservation Science
100 Hartwell Street, Suite 230
West Boylston, MA 01583

Jesse Leddick, Endangered Species Review Biologist
100 Hartwell Street, Suite 230
West Boylston, MA 01583

Massachusetts Division of Fisheries and Wildlife
Attn: Jason Zimmer, District Manager
195 Bournedale Road
Buzzards Bay, MA 02532

Massachusetts Department of Fish and Game
Natural Heritage and Endangered Species
Program Attn: Richard Lehan, General Counsel
251 Causeway Street, Suite 400
Boston, MA 02114

Massachusetts Department of Transportation
Highway Division, District 5
Attn: MEPA Coordinator
1000 County Street
Taunton, MA 02780

Massachusetts Historical Commission
The MA Archives Building
Ms. Brona Simon, SHPO & Executive Director
220 Morrissey Boulevard
Boston, MA 02125

Massachusetts Historical Commission
The MA Archives Building
Attn: Jonathan Patton
220 Morrissey Boulevard
Boston, MA 02125

Massachusetts Water Resource Authority
Attn: MEPA Coordinator
Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

10.4 STATE ELECTED OFFICIALS

Senator Brian A. Joyce
State House
Room 109D
Boston, MA 02133

Senator Mark C. Montigny
State House
Room 407
Boston, MA 02133

Senator Marc R. Pacheco
State House
Room 312B
Boston, MA 02133

Senator Michael J. Rodrigues
State House
Room 213B
Boston, MA 02133

Senator Michael F. Rush
State House
Room 504
Boston, MA 02133

Senator James E. Timilty
State House
Room 507
Boston, MA 02133

Representative Alan Silvia
State House
Room 33
Boston, MA 02133

Representative Jay F. Barrows
State House
Room 542
Boston, MA 02133

Representative Antonio F.D. Cabral
State House
Room 466
Boston, MA 02133

Representative Thomas J. Calter
State House
Room 527A
Boston, MA 02133

Representative Christine E. Canavan
State House
Room 146
Boston, MA 02133

Representative Keiko M. Orrall
State House
Room 540
Boston, MA 02133

Representative Claire D. Cronin
State House
Room 130
Boston, MA 02133

Representative Steven S. Howitt
State House
Room 237
Boston, MA 02133

Representative Angelo L. D'Emilia
State House
Room 548
Boston, MA 02133

Representative William C. Galvin
State House
Room 448
Boston, MA 02133

Representative Patricia A. Haddad
State House
Room 370
Boston, MA 02133

Representative Louis L. Kafka
State House
Room 185
Boston, MA 02133

Representative Robert M. Koczera
State House
Room 448
Boston, MA 02133

Representative Christopher M. Markey
State House
Room 136
Boston, MA 02133

Representative Shaunna O'Connell
State House
Room 237
Boston, MA 02133

Representative Elizabeth A. Poirier
State House
Room 124
Boston, MA 02133

Representative Paul R. Heroux
State House
Room 236
Boston, MA 02133

Representative Paul A. SchmidIII
State House
Room 473F
Boston, MA 02133

Representative William M. Straus
State House
Room 134
Boston, MA 02133

Representative of the 6th Bristol District
State House
Boston, MA 02133

Representative Susan Williams Gifford
State House
Room 542
Boston, MA 02133

10.5 REGIONAL AGENCIES

Greater Attleboro Taunton Regional Transit Authority
Administrative Office
Attn: Francis Gay
10 Oak Street
Taunton, MA 02780-3950

Metropolitan Area Planning Council
Attn: Marc Draisen
60 Temple Place
Boston, MA 02111

Old Colony Planning Council
Attn: Pat Ciaramella
70 School Street
Brockton, MA 02401-4097

Old Colony Planning Council
Attn: Robert Overholtzer
70 School Street
Brockton, MA 02401-4097

Southeastern Regional Planning and Economic Development District
Attn: Stephen C. Smith
88 Broadway
Taunton, MA 02780

Southeastern Regional Planning and Economic Development District
Attn: Jonathan Henry
88 Broadway
Taunton, MA 02780

Southeastern Regional Planning and Economic Development District
Attn: Randall Kunz
88 Broadway
Taunton, MA 02780

10.6 NATIVE AMERICAN TRIBES

Tribal Historic Preservation Officer – Mashpee Wampanoag Indian Tribe
Attn: Ms. Ramona Peters THPO
483 Great Neck Road, South
P.O. Box 1048
Mashpee, Massachusetts 02649

Tribal Historic Preservation Officer – Narragansett Indian Tribe
Attn: John Brown, THPO
4375-B South County Trail
P.O. Box 268
Charlestown, RI 02813

Tribal Historic Preservation Officer – Wampanoag Tribe of Gay Head (Aquinnah)
Attn: Bettina Washington, THPO
20 Black Brook Road
Aquinnah, MA 02535-9701

10.7 MUNICIPALITIES

Acushnet

Chair, Board of Selectmen
Acushnet Town Hall
122 Main Street
Acushnet, MA 027431

Planning Board
Acushnet Town Hall
122 Main Street
Acushnet, MA 02743

Conservation Commission
Acushnet Town Hall
122 Main Street
Acushnet, MA 02743

Board of Health
Acushnet Parting Ways Building
130 Main Street
Acushnet, MA 02743

Attleboro

Mayor Kevin J. Dumas
Attleboro City Hall
77 Park Street
Attleboro, MA 02703

Department of Planning& Development, City Hall
Government Center
77 Park Street
Attleboro, Ma. 02703

Conservation Commission
Government Center
77 Park Street
Attleboro, MA 02703

Health Department
City Hall
Government Center
77 Park Street
Attleboro, Ma. 02703

Frank Cook, President City Council
City Hall
77 Park Street
Attleboro, MA 02703

Berkley

Planning Board
Town Office Building
1 North Main Street
Berkley, MA 02779

Conservation Commission
Town Office Building
1 North Main Street
Berkley, MA 02779

Berkley Board of Health
1 North Main Street
Berkley, MA 02779

Stephen Castellina, Board of Selectman
Town Office Building
One North Main Street
Berkley, MA 02779-1336

Boston

City Council Main Office
1 City Hall Square, Suite 550
Boston, MA 02201-2043

Department of Neighborhood Development
26 Court Street, 8, 9 & 11th Floor
Boston, MA 02108-2501

Boston Conservation Commission
1 City Hall Square, Room 805
Boston, MA 02201

Boston Public Health Commission
1010 Massachusetts Ave, 2nd Floor
Boston, MA 02118

Bryan Glascock, Environment Department
1 City Hall Square, Room 805
Boston, MA 02201-2031

Braintree

Braintree Town Council
Braintree Town Hall
One JFK Memorial Drive
Braintree, MA 02184

Planning Board
90 Pond Street
Braintree, MA 02184

Conservation Commission
90 Pond Street
Braintree, MA 02184

Board of Health
90 Pond Street
Braintree, MA 02184

Canton

Chair, Board of Selectmen
Memorial Hall
801 Washington Street
Second Floor
Canton MA 02021

Town of Canton
Office of the Planning Board
Memorial Hall
2nd Floor
801 Washington Street
Canton, MA 02021

Town of Canton
Conservation Commission
801 Washington St
Canton MA 02021

Town of Canton
Board of Health
79 Pleasant Street
Canton, MA 02021

William Friel, Town Administrator
Memorial Hall
801 Washington Street
Second Floor
Canton MA 02021

Dartmouth

Chair, Select Board
Dartmouth Town Hall
400 Slocum Road
Dartmouth, MA 02747

Planning Board
Town Hall, Room 317
400 Slocum Rd.
Dartmouth, MA 02747

Conservation Commission
Town Hall, Room 119
400 Slocum Road
Dartmouth, MA 02747

Board of Health
Town Hall, Room 119
400 Slocum Road
Dartmouth, MA 02747

Dedham

Chair, Board of Selectmen
Town Administration Building
26 Bryant Street
Dedham, MA 02026

Planning Board
Town Administration Building
26 Bryant Street
Dedham, MA 02026

Conservation Commission
Town of Dedham
26 Bryant Street
Dedham, MA 02026

The Dedham Board of Health
Town Administration Building
26 Bryant Street
Dedham, MA 02026

<u>Dighton</u>

Chair, Board of
Selectmen
979 Somerset Avenue
Dighton, MA 02715

Planning Board
979 Somerset Ave
Lower Level
Dighton, MA 02715

Conservation Commission
979 Somerset Avenue
Dighton, MA 02715

Health Department
979 Somerset Avenue
Dighton ,MA 02715

<u>Easton</u>

Board of Health
136 Elm Street
North Easton, MA 02356

Chair, Colleen Corona
Board of Selectman
Selectmen's Office
136 Elm Street
Easton, MA 02356

David Colton, Town Administrator
136 Elm Street
North Easton, MA 02356

Planning Director
Planning and Community Development
136 Elm Street
North Easton, MA 02356

Christine Santoro, Chairman Planning and Zoning Board
136 Elm Street
North Easton, MA 02356

Stephanie Danielson, Conservation Commission
136 Elm Steet
North Easton, MA 02356

Historical Commission
c/o Planning and Community Development
136 Elm Street
North Easton, MA 02356

Fairhaven

Chair, Board of Selectmen
Town Hall
40 Center Street
Fairhaven, MA 02719

Planning Board
Town Hall
40 Center Street
Fairhaven, MA 02719

Conservation Commission
Town Hall
40 Center Street
Fairhaven, MA 02719

Board of Health
40 Center Street
Fairhaven, MA 02719

Fall River

Mayor William A. Flanagan
One Government Center, Room 619
Fall River, MA 02722

Conservation Commission
One Government Center
Fall River, MA 02722

Department of Health and Human Services
City of Fall River
One Government Center, Room 431
Fall River, MA 02722

Kenneth Fiola
Fall River Office of Economic Development
One Government Center
Fall River, MA 02722-7700

Elizabeth Dennehy, Planning Department
One Government Center
Fall River, MA 02722

Raymond Mitchell, City Councilor
City Council Office
One Government Center, 2nd floor Fall River,
MA 02722

Foxborough

Chair, Board of Selectmen
Town of Foxborough
40 South Street
Foxborough, MA 02035

Planning Board
Town of Foxborough
40 South Street
Foxborough, MA 02035

Conservation Commission
Town of Foxborough
40 South Street
Foxborough, MA 02035

Board of Health
Town of Foxborough
40 South Street
Foxborough, MA 02035

Freetown

Chair, Board of
Selectmen
P.O. Box 438
Assonet, MA 02702

Freetown Planning Department
P.O. Box 438
Assonet, MA 02702

Freetown Conservation Commission
P.O. Box 438
Assonet, MA 02702

Freetown Board of
Health
P.O. Box 438
Assonet, MA 02702

Lakeville

Chair, Board of Selectmen
Selectmen's Office
346 Bedford Street
Lakeville, MA 02347

Lakeville Planning Board
346 Bedford Street
Lakeville, MA 02347

Lakeville Conservation Commission
346 Bedford Street
Lakeville, MA 02347

Lakeville Board of
Health
346 Bedford Street
Lakeville, MA 02347

Open Space Committee
Town of Lakeville
346 Bedford Street
Lakeville, MA 02347

Brian Reynolds, Historical Commission
Town of Lakefille
346 Bedford Street
Lakeville, MA 02347

Mansfield

Chair, Board of Selectmen
Town Hall, 3rd Floor
6 Park Row
Mansfield, MA 02048

Mansfield Planning Board
Town Hall, 1st Floor
6 Park Row
Mansfield, MA 02048

Mansfield Conservation Commission
Town Hall, 1st Floor
6 Park Row
Mansfield, MA 02048

Mansfield Board of Health
6 Park Row,
Mansfield, MA 02048

Leonard Flynn, Mansfield Commissioner SRPEDD
Town Hall, 1st Floor
6 Park Row
Mansfield, MA 02048

Mattapoisett

Chair, Board of Selectmen
PO Box 435
16 Main Street
Mattapoisett, ma 02739

Mattapoisett Planning Board
PO BOX 435
16 Main Street
Mattapoisett, Ma. 02739
Mattapoisett Conservation Commission
PO BOX 435
16 Main Street
Mattapoisett, MA 02739

Board of Health
PO Box 434
16 Main St.
Mattapoisett, MA 02739

Middleborough

Chair, Board of Selectmen
Selectmen's Office
10 Nickerson Avenue
Middleborough, MA 02346

Town of Middleborough Planning Department
20 Center Street (Second Floor)
Middleboro, MA 02346

Middleborough Conservation Commission
Bank Building
20 Centre Street, 2nd floor
Middleborough, MA 02346

Town of Middleborough Health Department
20 Center Street
Middleboro, MA 02346

Office of Economic and Community Development
20 Centre Street, 3rd Floor
Middleboro, MA 02346

New Bedford

CEO City Council
c/o City Hall
133 William Street
New Bedford, MA 02740.

New Bedford Planning Department
Attn.: Jill Maclean
133 William Street, Room 303
New Bedford, MA 02740

New Bedford Conservation Commission
133 William Street, Room 304
New Bedford, MA 02740

New Bedford Board of Health
1213 Purchase Street, 1st Floor
New Bedford, MA 02740

Mayor Jon Mitchell
133 William Street, Room 311
New Bedford, MA 02740

Matthew Morrissey, New Bedford Economic Development Council
1213 Purchase Street (3rd floor)
New Bedford, MA 02740

Jane Gonsalves, City Council
133 William Street, Room 215
New Bedford, MA 02740

Joseph Lopes, City Council
133 William Street, Room 215
New Bedford, MA 02740

Rita Arruda, City Clerk
133 William Street, Room 118
New Bedford, MA 02740

Ann Louro, Preservation Planner
City of New Bedford
133 William Street, Room 303
New Bedford, MA 02740

Derek Santos, New Bedford Economic Development Council
1213 Purchase Street (3rd floor)
New Bedford, MA 02740

Norton

Chair, Board of Selectmen
70 East Main Street
Norton, MA 02766

Norton Planning Board
Norton Town Hall
70 East Main Street
Norton, MA 02766

Norton Board of Health
Norton Town Hall
70 East Main Street (2nd floor)
Norton, MA 02766

Norton Fire - Rescue Department
70 East Main Street
Norton, MA 02766

David Henry, Conservation Commission
70 East Main Street
Norton, MA 02766

Norwood

Chair, Board of Selectmen
Town Hall
566 Washington Street
Norwood, MA, 02062

Norwood Planning Board
Ground Floor of the Town Hall
566 Washington Street
Norwood, MA, 02062

Norwood Conservation Commission
Public Works Office
165 Nahatan Street
Norwood, MA 02062

Norwood Board of Health
Ground Floor of the Town Hall
566 Washington Street
Norwood, MA, 02062

Quincy

City Council
Quincy City Hall
1305 Hancock Street
Quincy, MA 02169

Department of Planning and Community Development
1305 Hancock Street
Quincy, MA 02169

Quincy Planning Board
Monroe Building
1245 Hancock Street
Quincy, MA 02169

Conservation Commission
Quincy City Hall
1305 Hancock St.
Quincy, MA 02169

Quincy Health Department
The Kennedy Center,
440 East Squantum Street,
Quincy, MA 02171

Raynham

Chair, Board of Selectmen/Health
558 South Main Street
Veterans Memorial Town Hall
Raynham, MA 02767

Raynham Planning Board
558 South Main Street
Veterans Memorial Town Hall
Raynham, MA 02767

Raynham Conservation Commission
558 South Main Street
Veterans Memorial Town Hall
Raynham, MA 02767

Health Department
Town of Raynham
558 South Main Street
Raynham, MA 02767

North Raynham Water District c/o Arthur S. Bendinelli
PO Box i
Raynham, MA 02767

Randall Buckner, Town Administrator
Town of Raynham
558 South Main Street
Raynham, MA 02767

Rehoboth

Chair, Board of Selectmen
148 Peck Street
Rehoboth, MA 02769
Planning Board
148 Peck Street
Rehoboth, MA 02769

Rehoboth Conservation Commission
148 Peck Street
Rehoboth, MA 02769

Rehoboth Board of Health
148 Peck Street
Rehoboth, MA 02769

Rochester

Chair, Board of Selectmen
Rochester Town Hall
1 Constitution Way
Rochester, MA 027701

Rochester Planning Board
Town Hall Annex
37 Marion Road
Rochester, MA 02770
Rochester Conservation Commission
Town Hall Annex
37 Marion Road
Rochester, MA 02770

Rochester Board of Health
Town Hall Annex
37 Marion Road
Rochester, MA 02770

Sharon

Chair, Board of Selectmen
Town Office Building
90 South Main Street
Sharon, MA 02067

Sharon Planning Board
90 South Main Street
Sharon, MA 02067

Sharon Conservation Commission
219 Massapoag Avenue
Sharon, MA 02067

Sharon Board of Health
Town Office Building
90 South Main St.
Sharon, MA 02067

Somerset

Chair, Board of Selectmen
Somerset Town Office, Room 23
140 Wood Street
Somerset, MA 02726

Somerset Planning Board
Somerset Town Office Building, First Floor
140 Wood Street
Somerset, MA 02726

Somerset Conservation Commission
Town Office Building, Room 22
140 Wood Street
Somerset, MA 02726

Somerset Board of Health
Town Office Building, Room 22
140 Wood Street
Somerset, MA 02726

Stoughton

Chair, Board of Selectmen
Town of Stoughton
10 Pearl Street, 3rd Floor

Stoughton Planning Board
10 Pearl Street, 2nd Floor - Engineering Office
Stoughton, MA 02072

Stoughton Conservation Commission
10 Pearl Street, 2nd Floor
Stoughton, MA 02072

Stoughton Board of Health
10 Pearl Street, 2nd Floor
Stoughton, MA 02072
George Pucci
Legal Counsel to Stoughton
Kopelman and Paige, P.C.
101 Arch Street
Boston, MA 02110

Swansea

Chair, Board of Selectmen
81 Main Street
Swansea, MA 02777

Swansea Planning Board
68 Stevens Road
Swansea, MA 02777

Swansea Conservation Commission
68 Stevens Road
Swansea, MA 02777

Swansea Board of Health
68 Stevens Road
Swansea, MA 02777

<u>Taunton</u>

City Council
Taunton City Hall
141 Oak Street
Taunton, MA 02780

Taunton Planning Board
City Hall Annex
15 Summer Street
Taunton, MA 02780

Taunton Conservation Commission
City Hall Annex
15 Summer Street
Taunton, MA 02780

Taunton Board of Health
45 School Street
Taunton, MA 02780

Mayor Tom Hoye
Taunton City Hall
141 Oak Street
Taunton, MA 02780

<u>Westport</u>

Chair, Board of Selectmen
WESTPORT TOWN HALL
816 MAIN ROAD
WESTPORT, MA 02790

Westport Planning Board
856 Main Road
Westport, MA 02790

Westport Conservation Commission
816 MAIN ROAD
WESTPORT, MA 02790

Board of Health
856 Main Road
Westport, MA 02790

Dr. Carlos M. Colley, Superintendent of Westport Community Schools
Westport Community Schools
17 Main Road
Westport, MA 02790

West Bridgewater

Chair, Board of Selectmen
65 North Main Street
West Bridgewater, MA 02379

10.8 LIBRARIES

State Transportation Library of Massachusetts
10 Park Plaza, 2nd Floor
Boston, MA 02116

Russell Memorial Library
88 Main Street
Acushnet, MA 02743

Guilford H. Hathaway Library
6 North Main Street
Assonet, MA 02702

Attleboro Public Library
74 North Main Street
Attleboro, MA 02703

Berkley Public Library
3 North Main Street
Berkley, MA 02779

Boston Public Library
Central Library
700 Boylston Street
Boston, MA 02116

Thayer Public Library
798 Washington Street
Braintree, MA 02184

Canton Public Library786 Washington Street
Canton, MA 02021

Southworth Library
732 Dartmouth Street
South Dartmouth, MA 02748

Dedham Public Library
43 Church St
Dedham, MA 02026

Dighton Public Library
395 Main Street
Dighton, MA 02715

Ames Free Library
15 Barrows Street
North Easton, MA 02356

The Millicent Library
45 Center Street, P.O. Box 30
Fairhaven, MA 02719

Fall River Public Library
104 North Main Street
Fall River, MA 02720

Boyden Library
10 Bird Street
Foxborough, MA 02035

James White Memorial Library
5 Washburn Rd.
East Freetown, MA 02717

Lakeville Public Library
4 Precinct Street
Lakeville, MA 02347

Mansfield Public Library
255 Hope St
Mansfield, MA 02048

Mattapoisett Free Public Library
7 Barstow Street
Mattapoisett, MA 02739

Middleborough Public Library
102 North Main Street
Middleborough, MA 02346

Milton Public Library
476 Canton Avenue
Milton, MA

New Bedford Free Public Library
613 Pleasant Street
New Bedford, MA 02740

Norton Public Library
68 East Main Street
Norton, MA 02766

Norwood Morrill Memorial Library
33 Walpole Street (Route 1A)
Norwood, MA 02062-0988

Thomas Crane Public Library
40 Washington St.
Quincy, MA 02169

Turner Free Library,
2 North Main Street
Randolph, MA

Raynham Public Library
760 South Main Street
Raynham, MA 02767

Blanding Public Library
124 Bay State Road
Rehoboth, MA 02769

Joseph H. Plumb Memorial Library
17 Constitution Way
P.O. Box 69
Rochester, MA 02770

Sharon Public Library
11 N Main St
Sharon, MA 02067

Somerset Public Library
1464 County Street
Somerset, MA 02726

Stoughton Library
84 Park St
Stoughton, MA 02072

Swansea Public Library
69 Main Street
Swansea, MA 02777

Taunton Public Library
12 Pleasant Street
Taunton, MA 02780

West Bridgewater Public Library
80 Howard Street
West Bridgewater, MA

Westport Free Public Library
408 Old County Road
Westport, MA 02790

10.9 PRIVATE ORGANIZATIONS

Attleboro Area Chamber of Commerce, c/o George Spatcher
Brockton Area Transit Authority, c/o Reinald Ledoux
Citizens Against the Rail Extension
Citizens Concerned About Tracks, c/o Heather Graf
Conservation Law Foundation, c/o Rafael Mares
Fairmont/Indigo Line Coalition, c/o Joan Tighe
Fall River Chamber of Commerce and Industry, c/o Robert Mellion
Friends of the Assonet River, c/o Linda Grubb
Greater Fall River Land Conservancy, c/o Alfred J. Lima
Green Futures, c/o Effie Woods
Greenwich Bay Watershed Group, c/o Richard Langseth
Historical Society, Easton
Ipswich River Watershed Association, c/o Kerry Mackin, Executive Director
Massachusetts Association of Conservation Commissions, c/o Sally A. Zielinski
Massachusetts Association of Conservation Commissioners, c/o Michele Girard
Massachusetts Association of Conservation Commissions, c/o Eugene Benson
Massachusetts Audubon Society, c/o E. Heidi Ricci
Massachusetts Rivers Alliance, c/o Julia Blatt
Massachusetts Sierra Club, c/o James McCaffrey
MetroSouth Chamber of Commerce, c/o Christopher Cooney
Mystic River Watershed Association, c/o Ekongkar Singh Khalsa

Natural Resources Trust of Mansfield, c/o Leonard Flynn
Neponset River Watershed Association, c/o Ian Cooke, Executive Director
New Bedford Area Chamber of Commerce, c/o Roy Nascimento
New Bedford Area Chamber of Commerce, c/o Douglas Leatham
New England Public Employees for Environmental Responsibility, c/o Kyla Bennett
New England Regional Council of Carpenters, c/o Ronald Rheaume
Parker River Clean Water Association, c/o David Mountain
Port of New Bedford Harbor Development Commission, c/o Kristin Decas
South Coast CEO Council, c/o Linda Rodrigues
South Coast Development Partnership, c/o Jennifer Menard
SouthCoast on Track, c/o David Tibbetts
Taunton Area Chamber of Commerce, c/o Kerrie Babin
Taunton Industrial Development Commission, c/o Richard Shafer
Taunton River Watershed Alliance, c/o Carolyn LaMarre
The Coalition for Buzzards Bay, c/o Mark Rasmussen
The Nature Conservancy, c/o Allison Bowden
The Nature Conservancy, c/o Robb Johnson
The Nature Conservancy, c/o Wayne Klockner
The United Regional Chamber of Commerce, c/o George I. Spatcher, Jr.
Vision 2020 Board of Directors, c/o John Bullard
WalkBoston, c/o Wendy Landman and Robert Sloane

10.10 INDIVIDUALS AND BUSINESSES

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Edgar Adams
Melinda Ailes, Massachusetts Small Business Development Center
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Priscilla Almquist-Olsen
Ken Amaral
Barbara Anzivino
Eric Arbeene
James M. Azevedo
Glenn Bachman
George Bailey
Angela Bannister
Peter Barney
Christopher Barros
Robert Bartell
Elaine J. Baskin
Sue Bass
Richard Beal
Ronald Becker, Cedar Shopping Centers, Inc.
David Benway
Jackie Benway
Bertil and Leona Berglund
Rick L. Bermey
Craig and Ann Binney
Bishop Stang High School
Mark Bloom, H & L Bloom, Inc.
George Boucher
Henry Bousquet
John T. Brine
Ann M. Brine
Bristol Community College
Carl Brugnoli
Burton Bryan
Hugh Buchanan
Virginia A. Buchanan
Dr. Walter Buchanan
William Carlson
Mr. and Mrs. Chris Carmichael
Bob Carney
Nick Castellina
Mary Castellina
Stephen Castellina
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Larry Chapman
John M. Charbonneau
Paul Cienniwa

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Jim Chisholm
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Daniel and Carol Cobb
Agnes and Daniel C. Cobb, Jr.
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Carolyn A. Cole
Richard Connor
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Jed Cornock
Paul Costa
Jean Thomas Coulombe
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Gert Crabtree
Barbara Craveiro
Mark B. Crouch
John Dacey
Chuck Dade
Elaine K. Dahlgren
John F. Dator, John F. Dator Agency
Steven Davis
Robert Demoura
Mary A. Dempsey
David Dennis
Peter Deschenes
Marianne DeSouza
Lynn Dhooge
David Dion
Gregg Dion
Nicole Dion
Paul DiNicola
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Rosemary Dolan
Frederick C. Dreyer Jr.
Steven Drobnis
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Bruce Duarte, Sr.
Heather Dunn
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Heather J. Edlund
Brian Edlund
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Aimee Fried-Hardy
Dottie Fulginiti
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Greg Galer
Joseph Garies
Peter Gay
Ruth Geoffroy
Neil and Karen Gibbons
Jay Gildea
Patricia L. and Jeffrey B. Gilson
Louis F. Gitto
Mary Golden
David Goldrick
Brian Gomes
Guillermo Gonzalez
Katherine Aucello Goyette
Heather Graf
John L. Green, South Eastern Massachusetts Private Carrier Association
Robert Gregory
Linda Grubb
David and Amy Guflia
Michael L. Guyette
John Haederle
Pauline Hamel
Wendy Hanawalt

Herbert Hands
Edmund Hands
Jeffery H. Hanson
David Hardy
James Hartnett
Peter Hawes
Candace Heald
Fred Healey
Gilbert Heino
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Jim Herbert
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Stephen Koss
Fred Kurtz
Gary A. Lambert, Jr.
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Daniel L. Lauzon
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Leatham & Associates
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Michael LeBlanc
Cynthia Lee
James Lee
Kate Levin
Richard Levine
Mr. and Mrs. Brian Lewis
Mr. and Mrs. Douglas Lewis
Mrs. Helen Lewis
Mr. and Mrs. Mark Lewis
Forrest Lindwall
Patti Linhares
Katherine Foster and Leon Litchfield
Lynne Loewald
Antoinette Lopes
James Lopes
Jill MacLean
Frederick Magee
Paul and Susan Male
John Malley
John Malloy
Trent Maltby
Ariane Martin
Hannah Martin
S. Martin
Scott Martin
Stephen Martyniak
Eileen Marum
Henry Mastey
James Mathes
Michael Mazzuca
James McCarthy
Richard J. McCarthy
Lihm McDonald
Gerry McDonald
Timothy and Mary McEntee
Dan McGaffey
Chris McGowen
Susan McGrath
Lynne McSweeny
Alves Medeiros
Ray Medeiros
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Robert Melz
Robert Mendillo
Carol Mendonca
Frank Meninno
Donald J. Michaud
Jon Mitchell
David Mittell
Paul Modlowski
John Moniz
Eric Monkiewicz
Dianne Monnin

Benjamin Monnin
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Peter J. Muise, First Citizen's Federal Credit Union
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H. Michael Nasif
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Michael A. Nelson
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Tom Obrien
David Oliveira
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Ron O'Reilly
Kevin O’Sullivan
Mary Otman
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Steven J. Ouellette
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Linda Palmieri
John Paolin
Linda Paolucci
Dennis Paquette
Daniel Paré
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Diane Peterson
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Brian and Elizabeth Starr
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S. Sull
Janice Sullivan
Jim Sullivan
Joan Sullivan
Kevin Sullivan
Allen Swanson
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Mario Tavolieri, Weaver's Cove Energy
Grant Taylor
Victoria Taylor
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John Theriault
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Fran Turner
David and Annette Tweedy
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Robert Venturo
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This joint FEIS/FEIR was prepared by the U.S. Army Corps of Engineers (USACE) and the USACE's contractor, The Louis Berger Group, Inc. Portions of the document specific to the requirements of MEPA were prepared by MassDOT and MassDOT's lead contractor, Vanasse Hangen Brustlin, Inc., including the MassDOT Preface, Chapter 7: Proposed Mitigation and MassDOT Proposed Section 61 Findings.

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11.2 THE LOUIS BERGER GROUP, INC.

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Role: Consultant Project Manager

Name/Title: Leo Tidd, AICP/Senior Environmental Planner
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Name/Title: Jason Ringler, CWB®, PWS/Senior Environmental Scientist
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Role: Biodiversity, Wetlands, Threatened and Endangered Species, and Water Resources

Name/Title: Stacey Barron, AICP/Principal Planner
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Role: Land Use, Open Space, Farmland Soils, and Visual Resources

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Education: Ph.D., Anthropology, Bryn Mawr College
M.A., Anthropology, Bryn Mawr College; M.A., Lehigh University
Experience: 30 years of experience in cultural resource and heritage management and historic preservation.
Role: Cultural Resources

Name/Title: Delland Gould/Senior Field Supervisor
Education: M.S. Candidate, Geoscience, University of Iowa
B.A., Sociology and Anthropology, West Virginia University
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Role: Cultural Resources

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B.A., Geography, University of New Mexico
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Role: Coastal Zone and Hazardous Materials

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B.A., Urban Studies, William Smith College
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Role: Environmental Justice, Indirect and Cumulative Effects

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Education: M.A., Environmental Policy, Lehigh University
B.A., International Relations, Lehigh University
Experience: 4 years experience in city and regional land use planning focusing on environmental sustainability and multi-modal transportation projects.
Role: Preparation of FEIS/FEIR

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Role: Graphics

11.3 EPSILON, INC. (SUBCONTRACTOR TO THE LOUIS BERGER GROUP, INC.)

Name/Title: Maureen Cavanaugh/Senior Consultant
Education: MUA, Urban Affairs, Boston University. BA/BS Fine Art/Nursing, University of Rochester.
Experience: 25 years in cultural resource management.
Role: Historic Resources (DEIS)

11.4 KKO, INC.

Name/Title: Katherine O'Neill
Education: Harvard University, Master of City and Regional Planning, Transportation and Computer Science,
Michigan State University, Bachelor of Science, City Planning Experience: 30 years in transportation systems analysis and planning. Role: Rail Operations (DEIS)

12 REFERENCES

Ambuel, B. and S.A .Temple. Area-dependent Changes in the Bird Communities and Vegetation of Southern Wisconsin Forests. Ecology 64: 1057–1068. 1983.

Anderson, P., C.J. Cunningham, and D.A. Barry. *Gravimetric Analysis of Organic Contamination in Railway Ballast*. Land Contamination & Reclamation 8(2). 2000.

Anderson, K.S. *Mammals in Hockomock Wonder Wetland*. Mass. Audubon Society, Lincoln, 34 p. n.d.

Armstrong, R.J. Jr. *Impacts of Commuter Rail Service as Reflected in Single-Family Residential Property Values*. Transportation Research Record No. 1466, pages 88-98. 1994.

Askins, R.A., M.J. Philbrick and D.S. Sugeno. *Relationship between Regional Abundance of Forest and the Composition of Forest Bird Communities*. Biological Conservation 39(2), pages 129-152. 1987.

Bertin, R.I. *Plant Phenology and Distribution in Relation to Recent Climate Change*. Journal of the Torrey Botanical Society 135: 126-146. 2008.

Bioreserve Partners. *Facts about the Southeastern Massachusetts Bioreserve*. Green Futures website. Available online at: http://www.greenfutures.org/projects/green/biofacts.html. Undated.

Bhattachyara, M., R.B. Primack and J. Gervein. *Are roads and railroads barriers to bumblebee movement in a temperate suburban conservation area?* Biological Conservation 109:37-45. 2003.

Blake, J.G. and J.R Karr. Species composition of bird communities and the conservation benefit of large versus small forests. *Biological Conservation*. 30:173-187. 1984.

Boston Globe, The. *Raynham Park Strikes Deal With Town on Slot Machine Parlor*. 11 June 2013.

Brooks, Robert T. Weather-related effects on woodland vernal pool hydrology and hydroperiod. In *Wetlands* (Vol. 24, No. 1, pp 104-114). The Society of Wetland Scientists. 2004.

Bradley, F., C. Book, and A.E. Bowles. *Effects of low altitude aircraft overflights on domestic turkey poults*. Report No. HSD TR 90 034. US Air Force Systems Command, Noise and Sonic Boom Impact Technology Program. 1990.

Burchell, R.W. and S. Mukherji. Conventional Development versus Managed Growth: The Costs of Sprawl. *American Journal of Public Health*, 93 (9), 1537. 2003.

Central Transportation Planning Staff. *South Coast Rail Environmental Justice Study*. Memorandum from CTPS to the South Coast Rail Project Interested Parties. Boston Metropolitan Planning Organization, Central Transportation Planning Staff: Boston, 2009.

_____. Memo: *South Coast Rail Work Trips to Boston*, 28 January 2011.

_____. South Coast Rail Travel Demand Analysis Results, 17 February 2009.

Chaffin, W.L. *History of the Town of Easton, Massachusetts*, 1886.

Chase, H.B. Jr. Great Woods Today. Natural Resources Trust of Mansfield website: Available online at: http://home.comcast.net/~nrtma/html/today.html. Accessed 12 October 2009. 2009.

Chen, H., A. Rufolo, and K.J. Dueker. "Measuring the Impact of Light Rail Systems on Single Family Home Values: A Hedonic Approach with GIS Application". Discussion Paper 97-3. Center for Urban Studies, College of Urban and Public Affairs, Portland State University, Portland OR. 1997.

Clinton, President William J. Executive Order: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The White House: Washington, D.C. 1994.

Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form, South Coast Rail Project (EEA# 14346), 3 April 2009 and 29 June 2011.

_____. Environmental Justice Policy of the Office of Energy and Environmental Affairs, Commonwealth of Massachusetts. 2002.

_____. Executive Office of Housing and Economic Development. *Rental Assistance Management*. <http://www.mass.gov/hed/housing/rental-assistance/>

Commonwealth of Massachusetts Executive Office of Transportation and Public Works, and Executive Office of Housing and Economic Development. *South Coast Rail Economic Development and Land Use Corridor Plan*. 2009

Compton, B.W., Jackson, S.D., McGarigal, K., *Conservation Assessment and Prioritization System (CAPS) South Coast Rail Analysis.* 18 September 2009.

Connaughton, J.L. "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis." Memorandum to Heads of Federal Agencies. 24 June2005.

Constitution of the Commonwealth of Massachusetts, Article XCVII. Approved and ratified on 7 November 1972.

Council on Environmental Quality. *Considering Cumulative Effects under the National Environmental Policy Act.* Executive Office of the President, Council on Environmental Quality: Washington, D.C. January 1997.

_____. Memorandum: *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions,* February 18, 2010.

_____. *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.* Executive Office of the President, Council on Environmental Quality: Washington, D.C. June 24, 2005.

Dahl, T.E. *Wetlands Losses in the United States 1780s to 1980s.* U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 13pp. 1990.

Davis, M.B. *Old Growth in the East* (revised survey). Available online at: http://www.primalnature.org/ogeast/survey.html. 2008, Accessed 6 October 2009.

DeGraaf, R. M., and Yamasaki, M. *New England wildlife: habitat, natural history, and distribution*. University Press of New England, Lebanon, NH, 482pp. 2001.

De Weese, J.M. *Vernal Pool Construction Monitoring Methods and Habitat Replacement Evaluation.* Ecology, Conservation, and Management of Vernal Pool Ecosystems – Proceedings from a 1996 Conference. California Native Plant Society, Sacramento, CA, 1998 pp. 217-223.

Division of Conservation Services (DCS). Open Space and Recreation Plan Requirements. Available online at: http://www.mass.gov/Eoeea/docs/eea/dcs/osplanreq08.pdf. 2008.

Donovan, T.M., F.R. Thompson III, J. Faaborg, and J.R. Probst. Reproductive success of migratory birds in habitat sources and sinks. Conservation Biology. 9(6): 1380–1395. 1995.

Economic Data Research Group. Basic Economic Variables. Data provided to Vanasse Hangen Brustlin, Inc. via e-mail on 16 October 2009. Economic Data Research Group: Boston.

Eigenbrod, F., S.J. Hecnor, and L. Fahrig. *Quantifying the road-effect zone: threshold effects of a motorway on anuran populations in Ontario, Canada*. Ecology and Society 14:24. Available online at: http://www.ecologyandsociety.org/vol14/iss1/art24. 2009.

Ewing, B., Bartholomew, K., Winkleman, S., Walters, J., Chen, D. *Growing Cooler*. Washington, D.C. Urban Land Institute. 2008.

Executive Office of Energy & Environmental Affairs and Executive Office of Transportation and Construction, *Guidelines for EIS/EIR Traffic Impact Assessment.* July 1989.

Executive Office of Transportation. Supplemental Ridership Memorandum, 17 February 2009.

Executive Office of Transportation and Public Works. Analysis of South Coast Rail Alternatives: Phase 1 Report. 30 April 2008.

_____. *Capacity Utilization Analysis Technical Memorandum,* 17 November 2008.

Faaborg, J., M. Brittingham, T. Donovan and J. Blake. Habitat fragmentation in the temperate zone. In: *Ecology and management of neotropical birds: a synthesis and review of critical issues*. T.E. Martin and D.M. Finch, eds. Pages 357-380. 1995.

Federal Aviation Administration. Notices to Airmen. Available online at: http://www.faa.gov/air_traffic/publications/notices/media/2011-02-10.pdf.

Federal Highway Administration. *Interim Guidance: Questions and Answers Regarding Indirect and Cumulative Impact Considerations in the NEPA Process*. U.S. Department of Transportation, Federal Highway Administration: Washington, D.C. January 31, 2003.

_____. *Highway Noise fundamentals*. 1980.

_____. Hydraulic Engineering Circular 22: *Urban Drainage Design Manual,* FHWA-NHI-10-009. n.d.

_____. *Manual of Uniform Traffic Control Devices, Chapter 4C, Traffic Control Signal Needs Studies*, 2003.

_____. Memorandum: *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA*, 6 December 2012.

_____. Letter from FHWA to USACE re: South Coast Rail Project, 17 January 2013.

_____. *Manual of Uniform Traffic Control Devices* (MUTCD), Washington, D.C. 2003.

_____. NEPA and Transportation Decisionmaking: *Secondary and Cumulative Impact Assessment in the Highway Project Development Process.* U.S. Department of Transportation, Federal Highway Administration Project Development Branch, HEP-31: Washington, D.C. April 1992.

_____. *Wildlife Crossing Structure Handbook: Design and Evaluation in North America*. Publication No. FHWA-CFL/TD-11-003. Lakewood, CO: U.S. Department of Transportation, Federal Highway Administration, Central Federal Lands Highway Division.

Federal Railroad Administration. Email Correspondence to Army Corps, 3 March 2010.

Federal Register: October 3, 2006 (Volume 71, Number 191, page 58363-58364), Notice of 90-day petition finding and initiation of status Review, United States Fish and Wildlife Service.

Federal Register: March 25, 2011, Notice of Availability of the Draft Environmental Impact Statement for the Proposed South Coast Rail Project, Commonwealth of Massachusetts, Department of the Army Permit Application Number NAE-2007-00698, accessed at <https://www.federalregister.gov/articles/2011/03/25/2011-7070/notice-of-availability-of-the-draft-environmental-impact-statement-for-the-proposed-south-coast-rail>

Federal Register: February 6, 2012 (Volume 77, Number 24, page 5880-5912), Endangered and Threatened Wildlife and Plants; Threatened and Endangered Status for Distinct Population Segments of Atlantic Sturgeon in the Northeast Region.

Federal Transit Administration. *Transit Noise and Vibration Impact Assessment*, May 2006.

Finch, D.M. Population ecology, habitat requirements, and conservation of neotropical migrant birds. USDA Forest Service Technical Report RM-205. 1991.

Flather, C.H. and Sauer, J.R. Using landscape ecology to test hypotheses about large scale abundance patterns in migratory birds. *Ecology*. 77(1): 28-35. 1996.

Forman, R.T.T. and L.E. Alexander. Roads and their major ecological effects. *Annual Review of Ecological Systems*. 29:207-31. 1998.

Freemark, K. and B. Collins. Landscape ecology of birds breeding in temperate forest fragments. In *Ecology and conservation of neotropical migrant landbirds* (J.M. Hagan & D. W. Johnston, eds.). Smithsonian Institution Press, Washington D.C. 1989.

Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions.* Synthesis Report of the Northeast Climate Impacts Assessment (NECIA), Cambridge MA: Union of Concerned Scientists. USC Publications. 2007.

HydroCAD Software Solutions LLC. HydroCAD Stormwater Modeling System, Version 7, Owner's Manual. Chocorua, New Hampshire. 2004.

Gibbs, J.P. and J. Faaborg. Estimating the viability of ovenbird and Kentucky warbler populations in forest fragments. *Cons. Biol*. 4(2): 193-196. 1990.

Goody Clancy. *South Coast Rail Economic Development and Land Use Corridor Plan*. Goody Clancy: Boston, MA. June 2009.

Green Features, Facts about the Southeastern Massachusetts Bioreserve. Available online at: http://www.greenfutures.org/projects/green/biofacts.html. Accessed January 2009.

Herkert, J.R. The effects of habitat fragmentation on midwestern grassland bird communities. *Ecological Applications* Vol. 4 No.3 pp. 461-471. 1993.

Holsinger, J.R. *The freshwater amphipod crustaceans (Gammaridae) of North America.* United States Environmental Protection Agency. Biota of Freshwater Ecosystems. Identification Manual 5: 1-89. 1972.

Horsley Witten Group. Town of Stoughton Open Space and Recreation Plan, public review draft April 2006.

Hunter, M.L., A.J.K. Calhoun, and M. McCollough. *Maine Amphibians and Reptiles*. University of Maine Press, Orono, ME. 1999.

Interagency Wild and Scenic Rivers Coordinating Council. 2004. Appendix C: Evaluation Procedure Under "Direct and Adverse."

ISO New England, Inc. *2007 New England Marginal Emission Rate Analysis*, July 2009.

Jackson, S.D. and C.R. Griffin. in *Proceedings of the international conference on wildlife ecology and transportation* (G.L. Evink, P. Garrett, D. Zeigler, and J. Berry, eds.). Report No. FL-ER-69-98. Tallahassee, FL. 1998.

Jorgensen, N. *A Sierra Club Naturalist's Guide to Southeastern New England*. Sierra Club Books: San Francisco. 1978.

Joyal, L.A., M. McCollough, and J.M.L. Hunter. Population structure and reproductive ecology of Blanding's Turtle (*Emydoidea blandingii*) in Maine, near the Northeastern edge of its range. *Chelonian Conservation and Biology* 3:580-588. 2000.

Leinberger, C.B. *The Option of Urbanism: Investing in a New American Dream*. Washington, D.C: Island Press, p 92-101, 2008.

Matlack G.R. *Microenvironment variation within and among deciduous forest edge sites in the eastern United States*. Biological Conservation 66: 1993.

Massachusetts Audubon Society. *Losing Ground (Second Edition): An Analysis of Recent Rates and Patterns of Development and Their Effects on Open Space in Massachusetts*. Massachusetts Audubon Society: Lincoln, MA. 1999.

_____. *Losing Ground: Beyond the Footprint* website. Available online at: http://www.massaudubon.org/losingground/. Accessed 5 October 2009.

_____. *Losing Ground: The Case for Land Conservation in Massachusetts*. Massachusetts Audubon Society: Lincoln, MA. 1987.

_____. *Losing Ground: At What Cost? (Third Edition of the Losing Ground Series), Changes in Land Use and Their Impact on Habitat, Biodiversity, and Ecosystem Services in Massachusetts*. Massachusetts Audubon Society: Lincoln, MA. 2003.

_____. Massachusetts Important Bird Areas. Available online at: <http://massaudubon.org/Birds_and_Birding/IBAs/index.php>. Accessed January 2009.

Massachusetts Bay Transportation Authority, *Service Delivery Policy*, MBTA Board of Directors approved 14 January 2009.

Massachusetts Department of Conservation and Recreation. Blue Hills Reservation. Available online at: http://www.mass.gov/dcr/parks/metroboston/blue.htm and http://www.mass.gov/dcr/parks/metroboston/blue hills brochure.pdf. Accessed 12 January 2009.

_____. Fowl Meadow and Ponkapoag Bog. Website. Available online at: http://www.mass.gov/dcr/stweardship/acec/acecs/l-fowmed.htm. Accessed 1 September 2009.

_____. Hockomock Swamp ACEC website: Available online at: (http://www.mass.gov/dcr/stewardship/acec/acecs/l-hcksmp.htm>.

Massachusetts Department of Environmental Protection. *Air & Climate: Greenhouse Gases & Climate Change, What the State is Doing: Global Warming Solutions Act*. Available online at: http://www.mass.gov/dep/air/climate/index.htm#gwsa. Accessed 12 October 2009.

_____. *Massachusetts Year 2010 Integrated List of Waters, Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act.* 2010.

_____. The Environmental Progress Report FY 2008-Wetlands. Commonwealth of Massachusetts, Department of Environmental Protection: Boston. Available online at: http://www.mass.gov/dep/water/priorities/wlfy08.htm. Accessed 4 October 2008.

_____. *Final Pathogen TMDL for the Buzzards Bay Watershed. March 2009.* Control Number: CN 251.1. 2009.

_____. *Final Pathogen TMDL for the Taunton River Watershed. June 2011*. Control Number: CN 256.0. 2011.

_____. *Statewide Greenhouse Gas Emission Level: 1990 Baseline and 2020 Business As Usual Projection*. Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Department of Environmental Protection: Boston. 2009.

_____. *Total Maximum Daily Loads of Bacteria for the Neponset River Watershed. May 2002*. Control Number: CN 121.0. 2002.

_____. *Wetlands PPA Summary and Workplan*. Commonwealth of Massachusetts, Department of Environmental Protection: Boston. Available online at: http://www.mass.gov/dep/water/priorities/09wet.pdf. Accessed 4 October 2009.

Massachusetts Department of Environmental Protection, Division of Watershed Management. *Massachusetts Year 2006 Integrated List of Waters*. October 2007.

Massachusetts Department of Environmental Protection, Division of Wetlands and Waterways. *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act: A Handbook.* 1995.

Massachusetts Department of Environment and Climate Change, New South Whales Government. Available online at: http://www.environment.nsw.gov.au/bioregions/BioregionsExplained.htm. Accessed January 2009.

_____. *Total Maximum Daily Loads of Bacteria for Neponset River Basin*. Approved by EPA on 21 June 2002.

Massachusetts Department of Revenue, Division of Local Services Property Tax Bureau's “Taxpayer's Guide to Classification and Taxation of Agricultural/Horticultural Land in Massachusetts” Chapter 61A. Available online at: http://www.charltontrust.org/ Chapter_61A_brochure.htm. October 1997.

Massachusetts Department of Fish and Game and The Nature Conservancy. *BioMap2: Conserving the Biodiversity of Massachusetts in a Changing World*. Commonwealth of Massachusetts, DFG Natural Heritage and Endangered Species Program, Westborough, MA, 60pp. 2010.

Massachusetts Executive Office of Energy and Environmental Affairs. *2008 Land Protection Report*. Executive Office of Energy and Environmental Affairs: Boston. 2008.

_____. *Boston Harbor Watersheds 2004 - 2009 Action Plan,* November 2004.

_____. *Buzzards Bay Project. Buzzards Bay Comprehensive Conservation and Management Plan*, August 1991.

_____. Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. April 3, 2009.

_____. Certificate of the Secretary of Energy and Environmental Affairs on the Notice of Project Change, Comprehensive Wastewater Management Plan (Winthrop Street, Davenport Terrace, Williams Street Sewer Extension). Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs: Boston. 2009.

_____. *Five-Year Watershed Action Plan for the Taunton River Watershed*, September 2006.

_____. Greenhouse Gas Emissions Policy and Protocol. Available online at: http://www.env.state.ma.us/mepa/pdffiles/misc/GHG%20Policy%20FINAL.pdf.

_____. "How Is Land Protected?" Commonwealth of Massachusetts, Executive Office of Environmental Affairs website. Available online at:http://www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Land+Use%2c+Habitats+%26+Wildlife&L2=Land+Use+%26+Conservation&L3=Land+Protection&sid=Eoeea&b=terminalcontent&f=eea_lf_land_protect_how&csid=EoeeaH. Accessed 17 June 2009.

_____. Land Disposition Policy, Article 97. Massachusetts Environmental Policy Act Office: Boston. 1998.

_____. *Mount Hope and Narragansett Bay Five-Year Action Plan*. November 2004

_____. Smart Growth/Smart Energy Toolkit. Available online at: http://www.mass.gov/?pageID=eoeeamodulechunk&L=1&L0=Home&sid=Eoeea&b=terminalcontent&f=eea_sgse_toolkit&csid=Eoeea. Accessed 27 May 2009.

Massachusetts Executive Office of Energy and Environmental Affairs, Department of Environmental Protection. *Final Massachusetts State Implementation Plan to Demonstrate Attainment of the National Ambient Air Quality Standard for Ozone*. Boston, 2008.

Massachusetts Executive Office of Labor and Workforce Development. Labor Force and Unemployment Data. < http://www.mass.gov/eolwd>. Accessed August 2008 and October 2010.

_____. Labor Force and Unemployment Data. Available online at: <http://lmi2.detma.org/lmi/lmi_lur_a.asp>. Accessed 8 July 2013.

Massachusetts Executive Office of Transportation and Massachusetts Executive Office of Housing and Economic Development. *South Coast Rail Economic Development and Land Use Corridor Plan*. June 2009.

Massachusetts Executive Office of Transportation and Public Works. *South Coast Rail Environmental Consequences Technical Report – Water Resources*, September 2009.

_____. South Coast Rail Environmental Notification Form. 2008.

_____. *Station Siting Report. EOT's Final Recommendations.* 10 October 2008.

Massachusetts Department of Agriculture Resources, *Massachusetts Prohibited Plant List*. Effective January 1, 2009. Available online at: http://www.mass.gov/agr/farmproducts/prohibitedplantlist.htm. Accessed 4 November 2012.

Massachusetts Invasive Plant Advisory Group. *The Evaluation of Non-Native Plant Species for Invasiveness in Massachusetts*. 2005.

MassDOT. *Boston Transportation Planning Review.* 1970-1973.

_____. *GreenDOT Policy Directive.* 2010.

_____. *MBTA Program for Mass Transportation*, 2003, 2010 Draft Update.

_____. Memorandum to Army Corps on South Station Planning and South Coast Rail. May 5, 2010.

_____. *South Coast Rail Plan for Action.* 2007.

_____. *South Station Expansion Project.* March 2013.

_____. *Toward a New Growth Policy for Massachusetts.* 1977.

_____. Interoffice Memorandum from M. Conyngham General Council to K. Walsh Director of Environmental Services dated 2 May 2011.

MassGIS. Database. Available online at: http://www.mass.gov/mgis/mapping.htm. Accessed 5, 7 October 2009.

_____. NRCS SSURGO-Certified Soils. Available online at: <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/soi.html>.

MassGIS. Data - DEP Wetlands (1:12,000). n.d.

Massachusetts General Laws, Chapter 30, Section 61

Massachusetts General Law Chapter 91, The Massachusetts Public Waterfront Act.

Metropolitan Area Planning Council – MAPC, 2007 Regional Transportation Plan for the Boston Region.

National Cooperative Highway Research Program (NCHRP). 25-25 Task 43, *Legal Sufficiency Criteria for Adequate Indirect Effects and Cumulative Impacts Analysis as Related to NEPA Documents.* 2008.

National Park Service Annotated Bibliography-Impacts of Noise on Wildlife. Available online at: http://www.nature.nps.gov/sound/assets/docs/Wildlife_AnnotatedBiblio_Aug2011.pdf.

National Wild and Scenic Rivers webpage. Available online at: http://www.rivers.gov/.

Natural Heritage Endangered Species Program, Classification of Natural Communities. Available online at: http://www.mass.gov/dfwele/dfw/nhesp/nhclass.htm. Accessed February 2009.

_____. *Priority Habitat and Estimated Habitat for Rare Species*. Available online at: http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/priority_habitat/priority_habitat_home.htm.

_____. Guidelines for the Certification of Vernal Pool Habitat. 2009.

_____. Rare Species Fact Sheets. Available online at: http://www.mass.gov/dfwele/dfw/nhesp/species_info/fact_sheets.htm. Accessed January 2009.

_____. letter dated January 8, 2009.

NEC Master Plan Working Group. *Northeast Corridor Master Plan Version 1.a*. Available online at: http://www.amtrak.com/servlet/ContentServer/Page/1241245669222/1237608345018. 2010.

Old Colony Planning Council – OCPC, Regional Transportation Plan for the Brockton Region. 2007.

Omnibus Public Lands Management Act of 2009.

Orman, R.T.T. and L.E. Alexander. Roads and their major ecological effects. *Annual Review of Ecological Systematics*. 29:207-31. 1998.

Pateakos, J. Grants for Executive Park to be unveiled. Herald News (April 3, 2009). Available online at: http://www.heraldnews.com/homepage/x180623384/Grants-for-Executive-Park-to-be-unveiled. Accessed 13 October 2009.

Pelletier S.K., L. Carlson, D. Nein, and R.D. Roy. *Railroad crossing structures for spotted turtles: Massachusetts Bay Transportation Authority–Greenbush rail line wildlife crossing demonstration project.* IN: Proceedings of the 2005 International Conference on Ecology and Transportation, Eds. Irwin CL, Garrett P, McDermott KP. Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: pp. 414-425. 2006.

Porneluzi, P., J.C. Bednarz, L.J. Goodrich, N. Zawada, and J. Hoover. Reproductive performance of territorial ovenbirds occupying forest fragments and a contiguous forest in Pennsylvania. *Cons. Biol.* 7(2): 618-622. 1993.

Primack, R.B. *A Primer of Conservation Biology, 4th Ed*. Sinauer Associates, Sunderland, MA, 349 pp. 2008.

Rawls, Brakensiek and Saxton, *Estimation of Soil Water Properties,* Transactions American Society of Agricultural Engineers 25(5): 1316 - 1320, 1328. 1982.

Reijnen, R. Disturbance by car traffic as a threat to breeding birds in The Netherlands. PhD thesis, DLO Institute of Forestry and Natural Resources. Wageningen, Netherlands. 1995.

Reijnen, R., R. Foppen, C. ter Braak, and J. Thissen. The effects of car traffic on breeding bird populations in woodland. III. Reduction of density in relation to the proximity of main roads. *Journal of Applied Ecology*. 32: 187-202. 1995.

Reijnen, R., R. Foppen, and H. Meeuwsen. The effects of traffic on the density of breeding birds in Dutch agricultural grasslands. Biological Conservation. 75: 255-260. 1996.

Reservitz, D. *Impacts of Commuter Rail Service on Residential Property Values*. Reservitz Law Offices: Brockton MA. 2009.

Rich, A.C., D.S. Dobkin, and L.J. Niles. Defining forest fragmentation by corridor width: the influence of narrow forest-dividing corridors on forest-nesting birds in southern New Jersey. *Conservation Biology* 8(4): 1109-1121. 1994.

Robbins, C.S., D.K. Dawson, and B.A. Dowell. Habitat area requirements of breeding birds in the middle Atlantic states. *Wildlife Monographs*. No. 103. 1989.

Robinson, S.K. Another threat posed by forest fragmentation: reduced food supply. Auk, 115(1): 1-3. 1998.

Robinson, S.K., F.R. Thompson III, T.M. Donovan, D.R. Whitehead, and J. Faaborg. Regional forest success and the nesting success of migratory birds. Science. 267: 1987-1990. 1995.

Rosenfield, R.N., C.M. Morasky, J. Bielefeldt, and W.L. Loope. *Forest Fragmentation and Island Biogeography: A Summary and Bibliography*. U.S. Department of the Interior Technical Report NPS/NRUW/NRTR 92/08. 1992.

Sievert, P.R., Compton B.W., and M. Grgurovic. Blanding's Turtle (*Emydoidea blandingii*) conservation plan for Massachusetts. Pages 161. Report for Natural Heritage and Endangered Species Program. Westborough, MA. 2003.

Smith, D.G. *The genus Synurella in New England (Amphipoda, Crangonyctidae)*. Crustaceana 53 (3): 304-306. 1987.

Sorrell, J.P. Using Geographic Information Systems to evaluate forest fragmentation and identify wildlife corridor opportunities in the Catarqui watershed. Available online at: http://wgs.nhb.com/sorrell/index.htm/. 1997.

Sorrie, B.A. and H.L. Woolsey. "The Status and Distribution of Atlantic White Cedar in Massachusetts", *in* A. Laderman, *Atlantic White Cedar Wetlands*, Westview Press. pp. 135-142, 1987.

South Coast Rail Inter-Agency Working Group. *State Investment in the South Coast Region and Implementation of the Corridor Plan: A Retrospective Analysis*. 23 February 2012.

South Station Planning and South Coast Rail ICG Meeting Presentation. 21 July 2010.

Southeastern Massachusetts Metropolitan Planning Organization. *FFY 2010-2013 Transportation Improvement Program (Draft)*. Prepared by the Southeastern Regional Planning and Economic Development District: Taunton, MA, 2009.

Southeastern Regional Planning and Economic Development District (SRPEDD). Available online at: http://www.srpedd.org/PPA-PDA.asp. Accessed 31 August 2009.

_____. Community Quickstats, based on U.S. Census Bureau data from 1990 and 2000, compiled summer 2007.

_____. Regional Transportation Plan for the New Bedford/Fall River/Taunton Region. 2007.

_____. Regional Open Space Plan, 2008.

_____. Town of Lakeville Priority Development and Priority Protection Area Plan, page 12. June 2008.

Steen, D.A. and J.P. Gibbs. *Effects of roads on the structure of freshwater turtle populations.* Cons. Biol. 18:1143-1148. 2004.

Systra Consulting, Inc., Technical Memorandum, Network Simulation Analysis of Proposed 2030 MBTA/Amtrak Operations. August 11, 2009.

Systra USA, Capacity Utilization Analyses Technical Memorandum. November 17, 2008.

Taunton River Stewardship Council. *Taunton River Stewardship Plan, Taunton River Wild & Scenic River Study*. Prepared by the Taunton Wild and Scenic River Study Committee, Southeastern Regional Planning & Economic Development District, and National Park Service—Northeast Region. 2005.

Thomasma, S.A.; Thomasma, L.E.; Twery, M.J. NEWILD (version 1.0) user's manual [Computer program]. 1998.

Tiner, R.W., D.B. Foulis, C. Nichols, S. Schaller, D. Petersen, K. Andersen, and J. Swords. Wetland Status and Recent Trends for the Neponset Watershed, Massachusetts (1977-1991). 1998.

Tiner, R.W. and W. Zinni. Recent wetland trends in southeastern Massachusetts. US Fish and Wildlife Service. Newton Corner, MA. 1988.

Transit Cooperative Research Program. *Transit-Oriented Development and Joint Development in the United States: A Literature Review*. Number 52. October 2002.

Transportation Research Board, National Research Council, *2000 Highway Capacity Manual*, Washington D.C., 2000.

University of Massachusetts- Amherst (College of Natural Sciences), The Nature Conservancy, Massachusetts Division of Ecological Restoration- Riverways Program, American Rivers, and others. *River and Stream Crossing Partnership. 2011. Massachusetts River and Stream Crossing Standards.* August 2004; revised March 1, 2006; revised March 1, 2011; corrected January 31, 2012.

Utah State University. Grass Manual. Available online at: http://herbarium.usu.edu/webmanual. Accessed 13 April 2012.

UMass Extension. *CAPS Index of Ecological Integrity*. Available online at: http://umasscaps.org/. 2011.

U.S. Army Corps of Engineers, Engineer Research and Development Center, *North American Digital Flora: National Wetland Plant List, version 2.4.0*. Available online at: https://wetland_plants.usace.army.mil. Accessed 29 June 2012.

U.S. Army Corps of Engineers, New England District Compensatory Mitigation Guidance. U.S. Army Corps of Engineers. Available online at: http://www.nae.usace.army.mil/Portals/74/docs/regulatory/Mitigation/CompensatoryMitigationGuidance.pdf. Accessed 26 April 2013. 20 July 2010.

U.S. Army Corps of Engineers, New England District Regulatory Division. New England District Compensatory Mitigation Guidance. Concord MA. 2010.

U.S. Army Corps of Engineers Regulatory Guidance Letter 08-02: Jurisdictional Determinations. Available online at: http://www.usace.army.mil/Portals/2/docs/civilworks/RGLS/rgl08-02.pdf. Accessed 18 April 2013. 26 June 2008.

U.S. Army Corps of Engineers. NEDEP-360-1-30, *The Highway Methodology*. October 1993.

_____. *The Highway Methodology Workbook Supplement, Wetland Functions and Values - a Descriptive Approach*. New England District, U.S. Army Corps of Engineers, NAEEP-360-1-30a. Concord, MA. 1999.

_____. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (ERDC/EL TR-12-1). Vicksburg Mississippi, U.S. Army Engineer Research and Development Center. 2012.

_____. *The Highway Methodology Workbook. Integrating Corps Section 404 Permit Requirements with the NEPA EIS Process*. New England District, U.S. Army Corps of Engineers, NEDEP-360-1-30. Concord, MA. 1993.

_____. New England District. Department of the Army General Permit: Commonwealth of Massachusetts. 2010.

_____. NEDEP-360-1-30, *The Highway Methodology Workbook*. October 1993.

_____. Available online at: http://www.nao.usace.army.mil/technical%20services/Regulatory%20branch/PN/08-RP_LOP_Final/08-RP-19%20Permit.pdf.

U.S. Census Bureau, Journey to Work Data, 1990, 2000.

_____. Population Data. 2010. Available online at: <http://www/census.gov/2010census/popmap/ipmtext.php?fl=25>.

_____. American Fact Finder, Community Facts. Available online at: <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>

_____. *Overview of Race and Hispanic Origin*. March, 2001. Available online at: <http://www.census.gov/prod/2001pubs/c2kbr01-1.pdf.

U.S. Department of Agriculture, Soil Conservation Service [now Natural Resources Conservation Service]. Referenced in "Natural Communities (from the Silvio O. Conte National Fish and Wildlife Refuge Final Action Plan and Environmental Impact Statement, October, 1995, U.S. Fish and Wildlife Service, Hadley, MA)."

_____. Conservation Engineering Division. *Urban Hydrology for Small Watersheds,* Technical Release 55. 1986.

_____. U.S. Forest Service. *A Guide to Creating Vernal Ponds.* 2002.

_____. U.S. Forest Service. *Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*. Available online at: http://www.stream.fs.fed.us/fishxing/aop_pdfs.html. 2008.

_____. Soils (Farmland Classification). Available online at: http://soils.usda.gov/technical/handbook/contents/part622.html#ex2. Accessed February 2009.

_____. *Soil Survey of Bristol County, Massachusetts (Northern Part).* 1978.

_____. *Soil Survey of Bristol County, Massachusetts (Southern Part).* 1981.

U.S. Department of Defense. Dictionary of Military and Associated Terms. 2005.

U.S. Department of Transportation. Department of Transportation (DOT) Order to Address Environmental Justice in Minority Populations and Low-Income Populations. Federal Register, Vol. 62, No. 72, pages 18377-18381. Washington, D.C. 1997.

_____. Federal Highway Transportation, *Manual on Uniform Traffic Control Devices for Street and Highways*. Web. Apr.-May 2012. Available online at: <http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf>. May 2012.

_____. Route 24, Fall River and Freetown, Massachusetts, Access Improvements Project; Environmental Assessment, Draft Individual Section 4(f) Evaluation, and Final Environmental Impact Report. U.S. Department of Transportation, Federal Highway Administration and Commonwealth of Massachusetts, Massachusetts Highway Department: Cambridge and Boston, MA. 2009.

U.S. Environmental Protection Agency (EPA). *Consideration of Cumulative Impacts in EPA Review of NEPA Documents.* EPA 315-R-99-02. U.S. Environmental Protection Agency, Office of Federal Activities: Washington, D.C. May 1999.

_____. County Air Quality Report- Criteria Pollutants, Geographic Area: Massachusetts, Year: 2008. EPA website. Available online at: http://iaspub.epa.gov/airsdata/adaqs.summary?geotype=st&geocode=MA&geoinfo=st%7EMA%7EMassachusetts&year=2008&fld=county&fld=stabbr&fld=regn&rpp=25. Accessed 25 September 2009.

_____. Ecoregions of Massachusetts, Connecticut, and Rhode Island. Available online at: (http://www.epa.gov/wed/pages/ecoregions/mactri_eco.htm). Accessed January 2009.

_____. *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis*. EPA, Office of Federal Activities. Washington, D.C. 1998.

_____. *Final Rule, Control of Hazardous Air Pollutants from Mobile Sources, 72 F.R. 8427*, February 26, 2007.

_____. *Final Mandatory Reporting of Greenhouse Gases Rule*. EPA website. Available online at: http://www.epa.gov/climatechange/emissions/ghgrulemaking.html. Accessed 25 September 2009.

_____. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2007*. 2009.

_____. *How to Conserve Water and Use it Effectively*. Available online at: http://www.epa.gov/nps/chap3.html. Accessed November 2009.

_____. NPL Listing and Pertinent Documents for the Shpack Landfill. Available online at: *http://www.epa.gov/region1/cleanup/resource/findnesites.html*.

_____. *Six Common Air Pollutants*. EPA website. Available online at: http://www.epa.gov/air/urbanair. Accessed 25 September 2009.

_____. *Wildlife Habitat Protection Guidance*, 2006.

U.S. Environmental Protection Agency. National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities. Available online at: http://www.epa.gov/npdes/pubs/cgp2012_finalpermit.pdf. 16 April 2013.

U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division, *Guidelines For Modeling Carbon Monoxide From Roadway Intersection*, Research Triangle Park, NC; EPA-454/R-92-005; November 1992.

_____. *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*, Research Triangle Park, NC; EPA-454/R-92-006; November 1992.

_____. Climate Change, Regulatory Initiatives. Available online at: <http://www.epa.gov/climatechange/EPAactivities/regulatory-initiatives.html>

U.S. Environmental Protection Agency, Office of Mobile Sources, MOBILE6.2 (Mobile Source Emission Factor Model), Ann Arbor, MI, May 2004 release.

U.S. Environmental Protection Agency, Office of Noise Abatement and Control. *Public health and welfare criteria for noise*. Government Publication 550/9 73 002. Washington, D.C. 1973.

U.S. Environmental Protection Agency, Office of Transportation and Air Quality, *Emission Factors for Locomotives*, EPA-420-F-09-025, April 2009.

U.S. Environmental Protection Agency, Region I, *2000 Annual Report on Air Quality in New England*, Lexington, Massachusetts; July 2001.

U.S. Fish and Wildlife Service, New England Field Office. Endangered Species Reviews/Consultations. Available online at: http://www.fws.gov/newengland/EndangeredSpec-Consultation_Project_Review.htm.

_____. *Classification of Wetlands and Deepwater Habitats of the United States.* Report No. FWS/OBS/-79/31.Washington, D.C. 1979.

_____. National list of plant species that occur in wetlands: National summary. Biological Report 88(24). Washington, D.C: 1988.

U.S. Global Change Research Program. *Global Climate Change Impacts in the United States,* 2009.

VHB. *Undergrade Bridge Inspection and Rating Report, MBTA New Bedford/Fall River Commuter Rail Extension Project, Stoughton Line*. Vanasse Hangen Brustlin, Inc.: Boston. 1995.

Villard, M., P.R. Martin and C.G. Drummond. Habitat fragmentation and pairing success in the ovenbird (*Seiurus aurocapillus*). Auk 110(4) pp. 759-768. 1993.

Weaver's Cove Energy, LLC. Community Benefits. Weaver's Cove Energy website. Available online at: http://www.weaverscove.com/proposal-community.html. Accessed 13 October 2009.

_____. *Resource Report 2 – Water Use and Quality*. Available online at: http://www.weaverscove.com/files/ResourceReport2.pdf.

_____. *Weaver's Cove Energy LNG Project, Offshore Berth Proposal, EEA # 13061. 2nd Draft Environmental Impact Report.* Prepared by Epsilon Associates, Inc.: Maynard, MA. See in particular Section 5.2.4.6, Federal Conformity Review Determination. 2009.

Weinstein, M. Impact of off-road vehicles on avifauna in Afton Canyon, California. Contract CA-060-CT7-2734. United States Bureau of Land Management, California Desert Program, Riverside, CA. 1978.

White House Office on Environmental Policy. Protecting America's Wetlands: A Fair, Flexible, and Effective Approach. Washington, D.C. 1993.

White House Office on Management and Budget. *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity.* 30 October 1997.

13 ACRONYMS AND ABBREVIATIONS

AAI	All Appropriate Inquiry
ACEC	Area of Critical Environmental Concern
ADA	Americans with Disabilities Act
AHCW	Automatic Highway Crossing Warning
APE	Area of Potential Effect
APR	Agricultural Preservation Restriction
ASTM	American Society for Testing and Materials
ATR	Automatic Traffic Recorder
BLSF	Bordering Lands Subject to Flooding
BM	BioMap
BMP	Best Management Practice
B.P.	Before Present
BVW	Bank, Bordering Vegetated Wetlands
CAAA	Clean Air Act Amendments
CAPS	Conservation Assessment and Prioritization System
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
Chapter 91	Massachusetts General Law Chapter 91
CIR	Color-Infrared
CMP	Conservation and Management Plan
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COC	Constituents of Concern
Corps	U.S. Army Corps of Engineers (also USACE)
CPI	Consumer Price Index
CSO	Combined Sewer Overflow
CSX	CSX Transportation, Inc.
CTEC	Centralized Electric and Traffic Control
CTPS	Central Transportation Planning Staff
CVP	Certified Vernal Pool
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
CWR	Continuous Welded Rail
CZM	Coastal Zone Management
CZMP	Coastal Zone Management Plan
dB	Decibels
DCAM	Division of Capital Asset Management
DCR	Department of Conservation and Recreation (Massachusetts)
DEIR	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Statement
DEP	Massachusetts Department of Environmental Protection (also MassDEP)

DFW	Massachusetts Division of Fisheries and Wildlife
DIF	District Improvement Financing
DO	Dissolved Oxygen
DOT	Department of Transportation
DPA	Designated Port Area
EEA	Massachusetts Executive Office of Energy and Environmental Affairs
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENF	Environmental Notification Form
EO	Executive Order
EOHED	Executive Office of Housing and Urban Development (Massachusetts)
EOT	Massachusetts Executive Office of Transportation and Public Works (now MassDOT)
EPA	U.S. Environmental Protection Agency (also USEPA)
EPH	Extractable Petroleum Hydrocarbon
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
ESA	Endangered Species Act (Federal)
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FREP	Fall River Executive Park
FPPA	Farmland Protection Policy Act
FTA	Federal Transit Administration
GATRA	Greater Attleboro Taunton Regional Transit Authority
GHG	Greenhouse Gases
GIS	Geographic Information Systems
GWSA	Global Warming Solution Act
HCM	*Highway Capacity Manual*
HOV	High Occupancy Vehicle
HSIPR	High Speed Intercity Passenger Rail
HSR	High-speed Rail
Hz	Hertz
IBA	Important Bird Area
ICG	Interagency Coordinating Group
IEI	Index of Ecological Integrity
ISO	Independent System Operator
ips	Inches per Second
IWPA	Interim Wellhead Protection Area
JTW	Journey-to-Work
kV	Kilovolt
Ldn	Day-Night Averaged Sound Level
LEDPA	Least Environmentally Damaging Practicable Alternative
Leq	Energy-Averaged Equivalent Sound Level
LID	Low Impact Development
LOS	Level of Service
LNG	Liquid Natural Gas

LRTP	Long Range Transportation Plan
LSF	Land Subject to Flooding
LSP	Licensed Site Professional
LUHPPL	Land Use with Higher Potential Pollutant Loads
LUW	Land Under Waterbodies and Waterways
MAPC	Metropolitan Area Planning Council
MAS	Maximum Authorized Speed
MassDEP	Massachusetts Department of Environmental Protection (also DEP)
MassDOT	Massachusetts Department of Transportation
MBTA	Massachusetts Bay Transportation Authority
MCP	Massachusetts Contingency Plan
MCRR	Massachusetts Coastal Railroad
MCZMP	Massachusetts Coastal Zone Management Program
MEPA	Massachusetts Environmental Policy Act
MESA	Massachusetts Endangered Species Act
MGL	Massachusetts General Law
MHC	Massachusetts Historical Commission
MIPAG	Massachusetts Invasive Plant Advisory Group
mips	Micro Inch per Second
$MMTCO_2e$	Million Metric Tons of Carbon Dioxide Equivalent
MOA	Memorandum of Agreement
MOVES	Motor Vehicle Emissions Simulator
MPO	Metropolitan Planning Organization
MRA	Multiple Resource Area
MSAT	Mobile Source Air Toxic
MUTCD	Manual of Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
National Register	National Register of Historic Places
NCHRP	National Cooperative Highway Research Program
NEC	Northeast Corridor
NEPA	National Environmental Policy Act
NHESP	Natural Heritage and Endangered Species Program
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NLEV	National Low Emission Vehicle
NMFS	National Marine Fisheries Service
NO_x	Nitrogen Oxides
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resources Conservation Service
O&M	Operations and Maintenance
OCC	Operational Control Center
OCPC	Old Colony Planning Council
OCS	Overhead Catenary System

OCS	Overhead Contact System
OHM	Oil or Hazardous Materials
ORAD	Order of Resource Area Delineation
ORW	Outstanding Resource Water
OSRD	Open Space Residential Development
PA	Programmatic Agreement
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDA	Priority Development Area
PE	Preliminary Engineering
PEM	Palustrine Emergent Marsh
PFO	Palustrine Forested Wetland
PM	Particulate Matter
POW	Palustrine Open Water
PPA	Priority Preservation Area
ppm	Parts Per Million
PSS	Palustrine Shrub Scrub
PTC	Positive Train Control
PVP	Potential Vernal Pool
RA	Riverfront Area
RAO	Response Action Outcome
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RFG	Reformulated Gasoline
RMS	Root Mean Square
ROS	Remedy Operation Status
ROSP	Regional Open Space Plan
ROW	Right-of-Way
RPA	Regional Planning Agency
RTA	Regional Transit Authority
RTDM	Regional Travel Demand Model
RTN	Release Tracking Number
RTP	Regional Transportation Plan
SCADA	Supervisory Control and Data Acquisition
SHPO	State Historic Preservation Office
SIP	State Implementation Plan (for air quality)
SRPEDD	Southeastern Regional Planning and Economic Development District
SRTA	Southeastern Regional Transit Authority
SSA	Sole Source Aquifer
STIP	State Transportation Improvement Program
SWL	Solid Waste Landfill
SWPPP	Stormwater Pollution Prevention Plan
TAZ	Traffic Analysis Zone
TCP	Traditional Cultural Property
TDR	Transfer of Development Rights
THPO	Tribal Historic Preservation Officer
TIF	Tax Increment Financing
TIGER	Transportation Investment Generating Economic Recovery

TIP	Transportation Improvement Program
TMC	Turning Movement Count
TMDL	Total Maximum Daily Load
TNM	Traffic Noise Model
TOD	Transit-oriented Development
TREDIS	Transportation Economic Development Impact System Model
TSD	Storage and Disposal
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers (also Corps)
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USEPA	U.S. Department of Environmental Protection
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USPS	United States Postal Service
UST	Underground Storage Tank
v/c	Volume–to–Capacity (ratio)
VdB	Vibration Velocity Levels in Decibels
VMT	Vehicle Miles Travelled
VOC	Volatile Organic Compound
VPH	Volatile Petroleum Hydrocarbon
WMA	Wildlife Management Area
WPA	Massachusetts Wetlands Protection Act
WSC	Wooded Swamp Coniferous
WSD	Wooded Swamp Deciduous
WSM	Wooded Swamp Mixed
µPa	Micropascals

14 INDEX